

Cisco IOS Service Diagnostics—Border Gateway Protocol, Open Shortest Path First and Quality of Service Scripts Users Guide

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The Service Diagnostics feature provides a bundled set of Tool Command Language (Tcl) scripts and Embedded Event Manager (EEM) policies written and tested by subject matter experts to facilitate diagnosing common networking issues in the areas of Border Gateway Protocol (BGP), Open Shortest Path First (OSPF), and Quality of Service (QoS). A new feature called Embedded Menu Manager (EMM)—available in Cisco IOS Software Release 12.4(20)T and later Cisco IOS images—may be used to guide the user in installing and deploying these scripts and policies.

Definitions

Feature	Description
API	Application Programming Interface
CLI	Command Line Interface
EEM	Embedded Event Manager
EMM	Embedded Menu Manager
ERM	Embedded Resource Manager
ESM	Embedded Syslog Manager
IFS	Cisco IOS File System
MDF	Menu Definition File
NA	Not Applicable
IOS	Internetwork Operating System
TBD	To Be Determined
TBS	To Be Supplied (at a later time)
TCL	Tool Command Language

Introduction to Service Diagnostics

The concept behind Service Diagnostics is to automate some of the vast troubleshooting experiences of Cisco engineers by using the existing scripting capabilities and embedded management tools in Cisco IOS. Cisco has been adding and enhancing such tools as EEM, Embedded Syslog Manager (ESM), and Embedded Resource Manager (ERM) to Cisco IOS over the past few years. This feature is meant to be the “glue” that combines one or more of these tools to automate common diagnostic scenarios.

The goal is to isolate the end user from the rigors of Tcl scripting, and/or EEM policy writing, and provide a simple interface for deploying and receiving feedback from scenario-specific troubleshooting scripts. Service Diagnostics provides CLI Tcl shell user interfaces as well as EMM

Menu Definition Files (MDF's) for deploying troubleshooting scenarios. The scripts are posted on the Cisco Beyond Website under the Diagnostic category <http://www.cisco.com/go/ciscobeyond>.

Deploying Service Diagnostic Scenarios

Installing Scripts

If your image has the EMM feature, it is much easier to use the MDF vs. the ZIP file. If not, you must use the tclsh helper scripts.

Installation Using tclsh CLI parser mode

1. Download the diagnostic scripts from Cisco Beyond Website:
<http://www.cisco.com/go/ciscobeyond>

Scripts will be organized into diagnostic scenarios, ie:
sdiag_bgp_1.0.zip

2. Unzip the scenario archive.
3. On the router's disk create a directory to store all the scripts.
4. Example:

```
Router# mkdir svc-diag
```

5. The files to be copied to the dir svc-diag (per scenario) are:

BGP

- sdiag_bgp.tcl
- bgp_neighbor_loss.tcl
- bgp_neighbor_formation.tcl
- bgp_neighbor_route.tcl
- sdiag_bgp_display.tcl
- sdiag_bgp_undeploy.tcl
- collectEmailParameters.tcl

OSPF

- ospf_adj_duplicate_rid.tcl
- ospf_intf_down_detached.tcl
- ospf_miss_area_id.tcl
- ospf_stuck_cases.tcl
- ospf_timer_expired.tcl
- sdiag_ospf.tcl
- sdiag_ospf_display.tcl
- sdiag_ospf_undeploy.tcl

QoS

- sdiag_qos.tcl
- sdiag_qos_display.tcl
- sdiag_qos_undeploy.tcl
- qos_drop_packet.tcl

Resource (CPU, memory, buffer monitoring)

- sdiag_resource.tcl
- sdiag_resource_display.tcl
- sdiag_resource_undeploy.tcl
- collectEmailParameters.tcl

6. copy tftp disk#:/svc-diag
7. The router will prompt for :-
 - a. Address or name of remote host []?
 - b. Source filename []? Give the full path where the script has to be copied from
 - c. Destination filename []?Give the path as disk#:/svc-diag/filename.tcl
8. Create a directory to store the user libraries and the template to send email

Example:Router# mkdir user_library

9. Copy the following support files from tftp to disk following the same procedure as above to the user_library:

BGP

- email_template
- userlib.tcl
- diag_lib.tcl
- sdiag_lib.tcl
- bgp_lib.tcl
- tclIndex
- lib.tcl

OSPF

- email_template_cmd
- email_setup.tcl
- diag_lib.tcl
- tclIndex
- lib.tcl
- ospf_lib.tcl
- acl_lib.tcl

QOS

- email_template_cmd
- email_setup.tcl
- diag_lib.tcl
- tclIndex
- lib.tcl

Resource (CPU, memory, buffer monitoring)

- diag_lib.tcl
- userlib.tcl
- email_template

Note: The Diagnostic Tcl scripts posted on Cisco Beyond will be digitally signed. If your Cisco IOS router image supports Tcl script signing, you may use this feature to verify the integrity of the downloaded scripts. For more information please see the topic "Signed Tcl Scripts" here http://www.cisco.com/en/US/products/ps6441/products_feature_guide09186a00808d65fe.html.

Installation Using EMM

1. Download the MDF containing the diagnostic scripts from Cisco Beyond Website: <http://www.cisco.com/go/ciscobeyond>

e.g., sdiag_bfp.mdf

Note: The MDF contains all the scripts and policy files needed for a scenario. It is like a ZIP, but also contains menu definitions to guide the user.

2. Copy the MDF to a file system that the router has access to, e.g. local disk:, flash:, or tftp: server.
3. From privileged exec-mode, launch EMM

```
Router# emm mdm tftp://my_tftp_server/sdiag_bgp.mdf
```

You will be presented with a main menu as follows:

```
=====
                                BGP Diagnostics
```

```
                                Enter ? for help or ?# for item help
```

- ```

```
1. Install Diagnostic Scripts
  2. Setup EEM Environment
  3. Deploy BGP Neighbor Loss Diagnostic Script
  4. Deploy BGP Neighbor Formation Problem Diagnostic Script
  5. Deploy BGP Route Problem Diagnostic Script
  6. Deploy All BGP Scripts
  7. Remove Diagnostic Policies
  8. Display Diagnostic Policy Configuration
  9. Exit

```
Enter selection [9]:
```

4. Press the number "1" (no Enter key is needed). You will be prompted for directories for the EEM user library and user policies as follows:

```
 Enter ? for help
```

```
Enter a directory to store the BGP diagnostic policies in the form of
a URL
```

```
(excluding filename, e.g. disk0:/svc_diag
```

```
Enter value [disk0:/svc_diag]:
```

```
 Enter ? for help
```

```
Enter a directory for the user library files in the form of a URL
(excluding filename, e.g. disk0:/user_lib
```

```
Enter value [disk0:/user_lib]:
```

**Note:** The MDF will query the router's available file systems and present a default directory that had sufficient free space to contain the diagnostic scripts and policies. Press the "Enter" key to accept the default.

### Deploying Scenarios

Deploy the script via tclsh with parameters "notification" "configuration history option" "event history option" "user policy directory" "user library directory" where:

```
The value for notification can be "email or syslog or all"
The value for configuration history option, event history option can
be "TRUE or FALSE"
The value for user policy and user library directories is the
respective full path where the scripts and library files are stored
```

For each scenario, the following sections document an example command line using tclsh.

#### BGP Neighbor Loss

```
Router#tclsh disk#:/sdiag_bgp.tcl bgp_neighbor_loss.tcl email TRUE
TRUE disk2:/ disk2:/user_lib
```

where

**sdiag\_bgp.tcl** is the registration script

**bgp\_neighbor\_loss.tcl** is the EEM policy script

the notification is **email**

the configuration history option is set to **TRUE**

the event history option is set to **TRUE**

the user policy directory is **disk2:**

the user library directory is **disk2:/user\_lib**

#### BGP Neighbor Formation:

```
Router#tclsh disk#:/sdiag_bgp.tcl bgp_neighbor_formation.tcl email
TRUE TRUE disk2:/ disk2:/user_lib 120
```

where

**sdiag\_bgp.tcl** is the registration script

**bgp\_neighbor\_formation.tcl** is the EEM policy script

the notification is **email**

the configuration history option is set to **TRUE**

the event history option is set to **TRUE**

the user policy directory is **disk2:**

the user library directory is **disk2:/user\_lib**

the timer value is **120**.

#### BGP Neighbor Route:

```
Router#tclsh disk#:sdiag_bgp.tcl bgp_neighbor_route.tcl email TRUE
TRUE disk#: disk#:/user_lib 120
```

where

**sdiag\_bgp.tcl** is the registration script

**bgp\_neighbor\_route.tcl** is the EEM policy script

the notification is **email**

the configuration history option is set to **TRUE**

the event history option is set to **TRUE**

```

the user policy directory is disk2:
the user library directory is disk2:/user_lib
the timer value is 120.

```

#### QoS

```

tclsh disk0:sdiag_qos.tcl qos_drop_packet.tcl syslog FALSE FALSE
disk0: inputfile disk0:/drop_file disk0:/svc_diag disk0:/user_lib

```

#### OSPF Stuck Cases

```

tclsh disk0:sdiag_ospf.tcl ospf_stuck_cases.tcl email TRUE TRUE
disk0:/svc_diag disk0:/user_lib

```

#### OSPF Timer Expired

```

tclsh disk0:sdiag_ospf.tcl ospf_timer_expired.tcl email TRUE TRUE
disk0:/svc_diag disk0:/user_lib

```

#### CPU Resource

```

tclsh <disk#:>/<dir_name>/sdiag_resource.tcl <cpu> <notification>
<configurationHistory> <EventHistory> <user_pol_dir> <user_lib_dir>
<process_name or interrupt> <high_threshold> <low_threshold>
<time_interval>

```

#### Memory Resource

```

tclsh <disk#:>/<dir_name>/sdiag_resource.tcl <memory> <notification>
<configurationHistory> <EventHistory> <user_pol_dir> <user_lib_dir>
<process_name> <high_threshold> <low_threshold> <time_interval>
<resource_allocation>

```

#### Buffer Resource

```

tclsh <disk#:>/<dir_name>/sdiag_resource.tcl <buffer> <notification>
<configurationHistory> <EventHistory> <user_pol_dir> <user_lib_dir>
<process_name> <high_threshold> <low_threshold> <time_interval>
<resource_allocation>

```

### Deployment Using EMM

1. After installation, select menu item "2" and answer the questions regarding EEM environment variables, e.g. `_email_to`, `_email_server`, etc.

```

=====
 BGP Diagnostics

 Enter ? for help or ?# for item help

1. Install Diagnostic Scripts
2. Setup EEM Environment
3. Deploy BGP Neighbor Loss Diagnostic Script
4. Deploy BGP Neighbor Formation Problem Diagnostic Script
5. Deploy BGP Route Problem Diagnostic Script
6. Deploy All BGP Scripts
7. Remove Diagnostic Policies
8. Display Diagnostic Policy Configuration
9. Exit

Enter selection [9]:

```

2. After setting up the EEM environment, select the menu item corresponding to the desired diagnostic. You will be prompted to select the type of reporting desired:

Select the type of notification to be sent when a problem is diagnosed

1. email
2. syslog

Enter choice:

If you select email reporting, you may add more information to the report, such as configuration change history:

Do you want to log configuration history?

1. Yes
2. No

Enter choice:

### Displaying Inputs

To display the inputs that have been given, invoke the file:

BGP:

- Router#tclsh disk#:/svc-diag/sdiag\_bgp\_display.tcl  
bgp\_neighbor\_loss.tcl (OR)

where

**sdiag\_bgp\_display.tcl** is the script that displays the BGP inputs on the router related to the BGP- EEM policy script passed as the argument

**bgp\_neighbor\_loss.tcl** is the BGP neighbor loss policy script

- Router#tclsh disk#:/svc-diag/sdiag\_bgp\_display.tcl  
bgp\_neighbor\_formation.tcl (OR)

where

**sdiag\_bgp\_display.tcl** is the script that displays the BGP inputs on the router related to the BGP- EEM policy script passed as the argument

**bgp\_neighbor\_formation.tcl** is the BGP neighbor formation policy script

- Router#tclsh disk#:/svc-diag/sdiag\_bgp\_display.tcl  
bgp\_neighbor\_route.tcl

where

**sdiag\_bgp\_display.tcl** is the script that displays the BGP inputs on the router related to the BGP- EEM policy script passed as the argument

**bgp\_neighbor\_route.tcl** is the BGP route policy script

### Resource

- tclsh disk#:/dir\_name/sdiag\_resource\_display.tcl <cpu>  
OR
- tclsh disk#:/dir\_name/sdiag\_resource\_display.tcl <memory>  
OR

- `tclsh disk#:/dir_name/sdiag_resource_display.tcl <buffer>`

### Display Status Using EMM

Simply select the menu item entitled "Display ..." In the sample BGP MDF below, type the number "8".

```

=====
 BGP Diagnostics

 Enter ? for help or ?# for item help

1. Install Diagnostic Scripts
2. Setup EEM Environment
3. Deploy BGP Neighbor Loss Diagnostic Script
4. Deploy BGP Neighbor Formation Problem Diagnostic Script
5. Deploy BGP Route Problem Diagnostic Script
6. Deploy All BGP Scripts
7. Remove Diagnostic Policies
8. Display Diagnostic Policy Configuration
9. Exit

Enter selection [9]:

```

### Removing Scenarios

To completely remove all the inputs related to a scenario, invoke the file:

BGP:

- Router#`tclsh disk#:/svc-diag/sdiag_bgp_undeploy.tcl`  
`bgp_neighbor_loss.tcl` (OR)  
where  
**sdiag\_bgp\_undeploy.tcl** is the script that removes the BGP inputs on the router related to the BGP- EEM policy script passed as the argument  
**bgp\_neighbor\_loss.tcl** is the BGP neighbor loss policy script
- Router#`tclsh disk#:/svc-diag/sdiag_bgp_undeploy.tcl`  
`bgp_neighbor_formation.tcl` (OR)  
where  
**sdiag\_bgp\_undeploy.tcl** is the script that removes the BGP inputs on the router related to the BGP- EEM policy script passed as the argument  
**bgp\_neighbor\_formation.tcl** is the BGP neighbor formation policy script
- Router#`tclsh disk#:/svc-diag/sdiag_bgp_undeploy.tcl`  
`bgp_neighbor_route.tcl`  
where  
**sdiag\_bgp\_undeploy.tcl** is the script that removes the BGP inputs on the router related to the BGP- EEM policy script passed as the argument  
**bgp\_neighbor\_route.tcl** is the BGP neighbor formation policy script

**QoS**

```
Router#tclsh disk#:/svc-diag/sdiag_qos_undeploy.tcl
qos_drop_packet.tcl
```

**OSPF**

```
Router#tclsh disk#:/svc-diag/sdiag_ospf_undeploy.tcl
ospf_stuck_cases.tcl
```

**Resource:****FOR CPU**

```
tclsh <disk#:>/<dir_name>/ <sdiag_resource_undeploy.tcl> <cpu>
<process name or interrupt>
```

**FOR MEMORY**

```
tclsh <disk#:>/<dir_name>/ <sdiag_resource_undeploy.tcl> <memory>
<process name>
```

**FOR BUFFER**

```
tclsh <disk#:>/<dir_name>/ <sdiag_resource_undeploy.tcl> <buffer>
<process name>
```

**Removal Using EMM**

Simply select the menu item entitled "Remove Diagnostic Policies". In the sample BGP MDF below, type the number "7".

```
=====
 BGP Diagnostics

 Enter ? for help or ?# for item help

1. Install Diagnostic Scripts
2. Setup EEM Environment
3. Deploy BGP Neighbor Loss Diagnostic Script
4. Deploy BGP Neighbor Formation Problem Diagnostic Script
5. Deploy BGP Route Problem Diagnostic Script
6. Deploy All BGP Scripts
7. Remove Diagnostic Policies
8. Display Diagnostic Policy Configuration
9. Exit

Enter selection [9]:
```

## BGP Diagnostics

The BGP configuration includes BGP peers configured using direct ip address and peer-group configurations.

### BGP Neighbor Loss

#### Triggers/Symptoms

Syslog message on the router indicating that the BGP neighbor x.x.x.x going from UP to DOWN.

The reasons could be:

1. The interface on the neighbor or the local router is shut.
2. Access-list is configured on the local or the neighbor router that is explicitly or implicitly denying the tcp, ip or udp packets from the other.
3. Any BGP configuration on the neighbor router is removed.

#### Actions/Outputs

We will see one of the following messages:

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_loss.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP NEIGHBOR LOSS IS:
Neighbor x.x.x.x has gone down and does not seem to be reachable
through ping. Check network connectivity.
```

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_loss.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP NEIGHBOR LOSS IS:
Neighbor x.x.x.x has gone down. However, configured neighbor is
reachable through ping. Check BGP configuration at the peer and any
access-list restrictions between the peers.
```

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_loss.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP NEIGHBOR LOSS IS:
Neighbor x.x.x.x has gone down and does not seem to be reachable
through ping. Check network connectivity, BGP configuration at peer
and any access-list restrictions between the peers
```

### BGP Neighbor Formation Problem

#### Triggers/Symptoms

“Show ip bgp neighbor” reflects BGP neighbor remains at ACTIVE, IDLE or CONNECT. The reasons could be:

1. The interface on the local or neighbor router is down.
2. Access-list is configured on the local or the neighbor router that is explicitly or implicitly denying the tcp, ip or udp packets from the other.
3. For iBGP neighbor “update-source Loopback” is not configured OR is misconfigured on the local or neighbor router.
4. For eBGP neighbor “update-source Loopback” or “ebgp-multihop is not configured OR is misconfigured on the local or neighbor router.

5. For indirectly connected eBGP or iBGP neighbors the static route or ip routing between the peers may be missing.

#### Actions/Outputs

We will see one of the following messages:

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_formation.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP NEIGHBOR FORMATION IS:
Neighbor x.x.x.x does not seem to be reachable through ping. Check
network connectivity, BGP configuration at the peer and any access
list restrictions between the peers.
```

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_formation.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP NEIGHBOR FORMATION IS:
Neighbor x.x.x.x is reachable through ping. Check BGP configuration at
the peer and any access list restrictions between the peers.
```

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_formation.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP NEIGHBOR FORMATION IS:
Neighbor x.x.x.x does not seem to be reachable through ping. Check
network connectivity and BGP configuration at the peer and/or any
access list restrictions between the peers.
```

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_formation.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP NEIGHBOR FORMATION IS:
Check BGP configuration and BGP neighbor reachability for neighbor
$ipaddr at the peer and/or any access-list restrictions between the
peers.
```

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_formation.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP NEIGHBOR FORMATION IS:
The configuration 'neighbor x.x.x.x update-source Loopback' may be
required on the local router.
The configuration 'neighbor x.x.x.x ebgp-multihop' may be required on
the local router.
```

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_formation.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP NEIGHBOR FORMATION IS:
Check network connectivity to the BGP neighbor x.x.x.x
```

## BGP Route Problem

### Triggers/Symptoms

This can be due to BGP route loss, route not being advertised to peer or route not getting originated as the routes are not installed in the routing table.

The reasons could be:

1. In the BGP, configuration synchronization is turned on (local router).
2. The configuration "next-hop-self" command is missing on the local router.
3. There is a mismatch in the prefix mask between the BGP configuration and the routing table.
4. All the routes in the bgp table are not valid and are not best path routes.

### Actions/Outputs

We will see one of the following messages:

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_route.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP ROUTE PROBLEM IS:
There is a mismatch between prefix mask in the IP routing table and
BGP configuration network x.x.x.x mask x.x.x.x
```

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_route.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP ROUTE PROBLEM IS:
Synchronization is turned on in the BGP configuration. Prefixes might
not be installed on the Routing table if they are not known through
IGP
```

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_route.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP ROUTE PROBLEM IS:
BGP Next-hop x.x.x.x of bgp prefix ix.x.x.x/y is not reachable as ping
fails; next-hop-self need to be configured in the bgp configuration of
the router
```

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_route.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP ROUTE PROBLEM IS:
THE ROUTES: x.x.x.x which is not marked as best path prefixes in the
BGP table are not installed in the routing table and so will not be
advertised to peer.
```

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_route.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP ROUTE PROBLEM IS:
Neighbor x.x.x. is not being advertised any routes.
```

```
*Oct 16 09:34:09.904: %HA_EM-6-LOG:
tmpsys:/eem_policy/bgp_neighbor_route.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR BGP ROUTE PROBLEM IS:
Best path route exists, Check for other reasons why Routes are not
advertised.
```

## QoS Diagnostics

### Triggers/Symptoms

QoS script is an application to support qos drop counters. Currently qos drop counters for policymap, classmap, traffic shapping, police, matchstatement etc. are displayed by the mib graphic browser, this is not easily caught when a packet drop happens. Using qos policy can inform a user when a drop happens, without looking at the mib browser manually.

The script runs with an input-file user given and report drop counters based on the template input-file. The user can find drop counters in the template file and it can be customized if user wants an diff\_only counter from policymap or a raw counter from policymap or classmap or an rawmatchstatement, etc. The user needs to specify which interface and which direction he/she wants the drop counter.

The inputfile has four fields. "diff\_only counter, class name, interface name, input/output direction", where the first field is if the user wants to have diff\_only counters, diff\_only counter is the new drop counter between the last report time and this new report time. The second field is for which policymap/classmap/matchstatement the user wants to have a drop counter reported (the classname can be a policymap, classmap or matchstatement), the third field is for which interface the user wants to have a drop counter reported and the forth field is for which service policy direction the user wants the drop counter reported.

When diff only is specified, all classmap diff counters for the interface at the service policy user specified, will be reported, so the second field for class\_name does not matter.

An example of the user input file:

```
yes qoscl gi0/0 input
```

This one will report all different drop counters in interface giga0/0 at input service policy during this 15 minutes.

The other example can be:

```
no PingTest e0/0 input
```

PingTest is the policymap name in the interface e0/0. Our qos script will report which drop counter PingTest will have at interface e0/0 on input direction.

The other example can be:

```
no PingPackets gi0/0 output
```

PingPackets is the classmap name in the interface e0/0 here.

when 2 classmaps as inputs are given by user in inputfile as the following:

```
"no qoscl giga0/0 input
no qoscl giga0/0 output"
```

### Actions/Outputs

We will see the different output based on different inputfile, For first example of the inputfile, we will see the following report:

```
*Dec 13 10:27:31.765: %HA_EM-6-LOG:
tmpsys:/eem_policy/qos_drop_packet.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR QOS DROP COUNTER is:
```

```
Interface gi0/0, service policy direction "input" on policymap
"qospoll1":
New drop during this 15 minutes for classmap qosc1 is 732087551, its
match statement is "protocol ip"
```

```

*Dec 13 10:27:31.765: %HA_EM-6-LOG: tmpsys:/eem_policy/a.tcl:
Email result will not be sent, please look at console or buffer on
service diagnostic messages

```

For last example of the inputfile, we will see the following output:

```
*Dec 12 16:28:53.361: %HA_EM-6-LOG:
tmpsys:/eem_policy/qos_drop_packet.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR QOS DROP COUNTER is:
Interface gi0/0, service policy direction "input" on policymap
"qospoll1":
CLASSMAP <name>: qosc1 <description>: matchAll <drop packet>:
24212663 <pre-policybyte>: 1453197660 <post-policybyte>: 437880
<match statement>: protocol ip
Interface gi0/0, service policy direction "output" on policymap
"qospoll10":
CLASSMAP <name>: qosc1 <description>: matchAll <drop packet>: 1326
<pre-policybyte>: 722721 <post-policybyte>: 643161 <match
statement>: protocol ip

*Dec 12 16:28:53.369: %HA_EM-6-LOG: tmpsys:/eem_policy/a.tcl:
Email result will not be sent, please look at console or buffer on
service diagnostic messages
```

The output reported 2 classmap drop counters based on user input file:

This first classmap qosc1 is a classmap in interface giga0/0 on input direction.

The second classmap qosc1 is a classmap in interface giga0/0 on output direction.

## OSPF Diagnostics

### OSPF Neighbor Loss

Triggers/Symptoms

The OSPF neighbor loss scenario has the following 3 policies:

#### **ospf\_intf\_down\_detached.tcl**

This policy checks the syslog message for interface down and detached.

```
%OSPF-5-ADJCHG: *DOWN, Neighbor Down: Interface down or detached"
```

The possible reason can be:

1. The interface shut in its own router is configured (admin down)
2. An interface shut in remote end is configured and near end has a Down Down
3. Passive-interface is configured.

#### **ospf\_miss\_area\_id.tcl**

The policy checks the syslog error message for miss area id:

%OSPF-4-ERRRCV: Received invalid packet: mismatch area ID"

It gives addition information to explain additionally on the message and give what the user has configured in the router.

#### **ospf\_timer\_expired.tcl**

The policy checks syslog message for timer\_expired:

%OSPF-5-ADJCHG:.\*DOWN, Neighbor Down: Dead timer expired

The possible reason can be:

1. Remote end shut in Ethernet interface.  
Please note, when remote end in Fastethernet interface, the syslog message is not Dead timer expired. Instead it is  
"%OSPF-5-ADJCHG:.\*DOWN, Neighbor Down: Interface down or detached"
2. ip address list is configured.
3. ospf is removed from the remote end.

#### Actions/Outputs

The examples for neighbor loss output policies can be:

```
*Nov 20 11:29:32.331: %OSPF-5-ADJCHG: Process 107, Nbr 132.0.0.1 on
GigabitEthernet0/0 from FULL to DOWN, Neighbor Down: Interface down or
detached
*Nov 20 11:29:33.531: %HA_EM-6-LOG:
tmpsyst:/eem_policy/ospf_intf_down_detached.tcl:
THE SERVICE DIAG MESSAGE FOR INTERFACE DOWN DETACHED is:
OSPF Neighbor 132.0.0.1 down is caused by interface shut down. Please
"no shut" the interface GigabitEthernet0/0 to bring the adjacency up

*Nov 20 11:29:33.535: %HA_EM-6-LOG:
tmpsyst:/eem_policy/ospf_intf_down_detached.tcl:
Email result will not be sent, please look at console or buffer on
service diagnostic messages

```

### **OSPF Neighbor Formation Problem**

#### Triggers/Symptoms

The OSPF neighbor formation scenario includes two scripts:

#### **ospf\_adj\_duplicate\_rid.tcl**

The script detects the syslog message:

%OSPF-4-DUP\_RTRID\_NBR: OSPF detected duplicate router-id .\* on interface

and gives addition information for which kind of case can cause the duplicate router id.

#### **ospf\_stuck\_cases.tcl**

The script is a timer based script to check if the router is stuck at one of the following states:

1. Stuck at attempt state, which can be caused by wrong neighbor configuration  
For example, the following configuration can cause router stuck at attempt state:

```
router ospf 107
```

```

log-adjacency-changes
 network 131.107.0.0 0.0.255.255 area 0
 neighbor 131.107.5.11 ----- The neighbor is not existing and
the neighbor should be 131.107.5.2

```

2. Stuck at init state, can be caused by the access list in the remote end side. The script can provide a suggestion for this case.
3. Stuck at exstart/exchange state, can be caused by an mtu problem.

#### Actions/Outputs

For ospf neighbor formation problem, the screen output can be:

For duplicate router rid is:

```

THE SERVICE DIAG MESSAGE FOR ADJ DUPLICATE RID is:
The message happens when two routers are configured with the same
router id. Check the router ids on them to make sure they have
individual router ids and restart the ospf protocol by doing "no
router ospf <ospf_id>" and "router ospf <ospf_id>" in configuration
mode or "clear ip ospf <process_id> process" in super user mode

*Nov 15 09:29:30.635: %HA_EM-6-LOG:
tmpsys:/eem_policy/ospf_adj_duplicate_rid.tcl:
Email result will not be sent, please look at console or buffer on
service diagnostic messages

```

For stuck at INIT:

```

THE SERVICE DIAG MESSAGE FOR STUCK CASES is:
OSPF neighbor 131.107.1.2 is stuck at INIT might be due to access list
on remote end blocking OSPF hellos or authentication config is present
on one side, Please check the access-list or enable authentication on
both sides.

*Nov 27 10:55:07.067: %HA_EM-6-LOG:
tmpsys:/eem_policy/ospf_stuck_cases.tcl:
Email result will not be sent, please look at console or buffer on
service diagnostic messages

```

For stuck at EXCHANGE:

```

THE SERVICE DIAG MESSAGE FOR STUCK CASES is:
OSPF neighbor 131.107.1.2 is stuck at EXCHANGE might be due to
unmatched mtu, the stuck interface GigabitEthernet0/0 has mtu value
3456, Please check mtu value in remote side to make sure they are
synchronized

*Nov 14 15:29:27.559: %HA_EM-6-LOG:
tmpsys:/eem_policy/ospf_stuck_cases.tcl:
Email result will not be sent, please look at console or buffer on
service diagnostic messages

```

stuck at ATTEMPT:

```

THE SERVICE DIAG MESSAGE FOR STUCK CASES is:
Stuck at ATTEMPT might be due to wrong neighbor configuration. The
neighbor address 131.107.5.11 might not exist. Please check the
correct one and reconfigure it

```

```

*Nov 27 10:43:18.083: %HA_EM-6-LOG:
tmpsys:/eem_policy/ospf_stuck_cases.tcl:
Email result will not be sent, please look at console or buffer on
service diagnostic messages

```

## Resource Diagnostics

### Triggers/Symptoms

CPU, Memory, or buffer resource diagnostics are all triggered by crossing of user settable usage thresholds. Service Diagnostic scripts in this area use two embedded IOS features – ERM and EEM. The scripts dynamically generate an EEM policy that uses an ERM event detector in the area to be monitored.

### Actions/Outputs

The actions/outputs of these policies are limited to reporting the threshold crossings. The value-add (over using ERM directly) is the email notification capability, as well as providing a wrapper for quickly configuring ERM (which is fairly complex). A typical message follows:

```

*Feb 25 16:44:25.235: %HA_EM-6-LOG: tmpsys:/eem_policy/sdiag_Exec.tcl:
THE SERVICE DIAGNOSTIC MESSAGE FOR RESOURCE CPU MONITORING IS :
Process Exec with PID 227 exceeded the configured CPU utilization
threshold 20

```

### Please note, caveats:

1. Sometimes there is an EEM Tcl Error which is due to email\_template not being restaged. Since this issue does not have definite steps to be reproduced the workaround for this issue is to do the following on the router:
 

```

Router#> no event manager directory user library disk#:/<user library
name>
Router#> event manager directory user library disk#:/<user library
name>

```
2. All the BGP scripts will work only with IPv4.
3. There are three sev 3 bugs CSCsx65581, CSCsx53550, CSCsx47799 and 2 sev 4 bugs CSCsx60168, CSCsx65614 that are to be resolved.
4. When the BGP configuration on the router is huge, the existing BGP policies may exceed the maxrun time value for the policy, hence the user needs to change the maxrun timer value in the policy according to their BGP configurations.



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