EIGRP Troubleshooting

Introduction

This document provides troubleshooting information for common problems with Enhanced Interior Gateway Routing Protocol (EIGRP). For the commonly used troubleshooting refer to the Main Troubleshooting Flowchart.

Prerequisites

Readers of this document should have a good understanding of how EIGRP works and a good knowledge of Configuring EIGRP.

Components Used

This document is not restricted to specific software and hardware versions.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

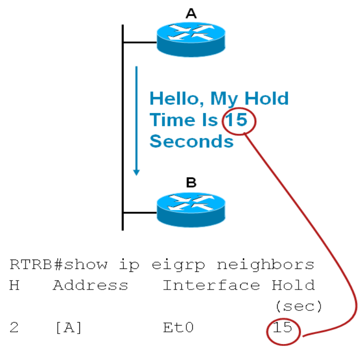
For more information on document conventions, refer to the Cisco Technical Tips Conventions.

Contents

Americas Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Neighbor Process

How long do I need to wait without hearing an EIGRP packet from a neighbor before declaring it dead?



The hold timer defines how long to wait without hearing an EIGRP packet from a neighbor before declaring them down.

Each EIGRP router includes its own hold time in the hellos it sends. This allows it to define how long its neighbors should wait for it. This allows us to have different hello/hold timers on routers on the same subnet, unlike OSPF or IS-IS.

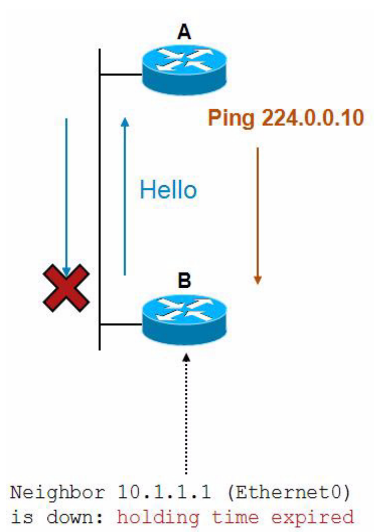
The hold time defaults to 3 X the default hello intervals; therefore, the default hold time for low-speed NBMA networks is 180 seconds (3 X 60 second hellos) and 15 seconds for all other interface types (3 X 5 seconds).

Note If you change the hello interval using the **ip hello-interval eigrp** command, it does not automatically change the hold time to 3 X the new value; you must also set the hold time to the value desired.

Holding Time Expired

How to troubleshoot the holding time expiry when an EIGRP packet is not received during hold time?

.



Step 1 Ping the multicast address (for example: 224.0.0.10) from the other router.

> **Note** If there are a lot of interfaces or neighbors, you should use extended ping and specify the source address or interface.

When an EIGRP packet is received from a neighbor, the hold timer for that neighbor resets to the hold time supplied in that neighbor's hello packet, then the value begins decrementing (if you use **show ip eigrp neighbor** command, you should see the hold time value changing).

The hold timer for each neighbor is reset back to the hold time when each EIGRP packet is received from that neighbor (earlier it needed to be a hello received, but now any EIGRP packet will reset the timer).

Since hellos are sent every five seconds on most networks, the hold time value in a **show ip eigrp neighbors** is normally between 10 and 15 (resetting to hold time (15), decrementing to hold time minus hello interval or less, then going back to hold time)

Step 2 Use **debug eigrp packet hello** command. This command provides debug output to the console or buffer log (depending on how you have it configured) that will show the frequency of hellos sent and received.

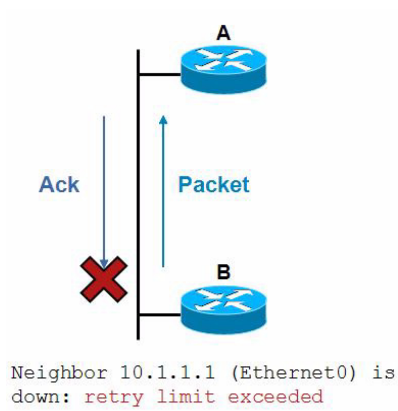
You should make sure you have the timestamps for the debugs set to a value that you can actually see the frequency; for example:

```
service timestamps debug datetime msec
```

Remember that any time you enable a debug on a production router, you are taking a calculated risk. It is always better to use all of the safer troubleshooting techniques before resorting to use debug commands.

Retry Limit Exceeded

How to troubleshoot when the retry limit gets exceeded and when there is no acknowledgement from the other router?



EIGRP sends both unreliable and reliable packets.

Hellos and acks are unreliable packets. Updates, queries, replies, SIA-queries and SIA-replies are reliable packets. Reliable packets are sequenced and require an acknowledgement. They are retransmitted up to 16 times if not acknowledged.

Exceeding the retry limit means that the router is sending reliable packets which are not getting acknowledged by a neighbor. When a reliable packet is sent to a neighbor, the neighbor must respond with a unicast acknowledgement. If a router is sending reliable packets and not getting acknowledgements, one of two things are probably happening

- The reliable packet is not being delivered to the neighbor.

- The acknowledgement from the neighbor is not being delivered to the sender of the reliable packet.

These errors are normally due to problems with delivery of packets, either on the link between the routers or in the routers themselves. Congestion, errors, and other problems can all keep unicast packets from being delivered properly.

You should look for queue drops, errors, and so on, when the problem occurs, and try to ping the unicast address of the neighbor to see if unicasts in general are broken or whether the problem is specific to EIGRP.

Reliable packets are re-sent after Retransmit Time Out (RTO). If a reliable packet is not acknowledged before 16 retransmissions and the hold timer duration has passed, re-initialize the neighbor.

This is the typical 6 x Smooth Round Trip Time (SRTT):

- Minimum 200 ms
- Maximum 5000 ms (five seconds)
- 16 retransmits takes between 50 and 80 seconds

The RTO is used to determine when to retry sending a packet when an Ack has not been received, and is (generally) based on 6 X SRTT. The SRTT is derived from previous measurements of how long it took to get an Ack from this neighbor. Each retry backs off 1.5 times the last interval.

The minimum time required for 16 retransmits is approximately 50 seconds (minimum interval of 200 ms with a max interval of 5000 ms). For example, If there isn't an acknowledgement after 200 ms, the packet is retransmitted and we set a timer for 300 ms. If it expires, we send it again and set the timer for 450 ms, then 675 ms, etc., until 5000 ms is reached. 5000 ms is then repeated until a total of 16 retransmissions have been sent.

The maximum time for 16 retransmits is approximately 1 minute, 20 seconds, if the initial retry is 5000 ms and all subsequent retries are also 5000 ms.

If a reliable packet is retransmitted 16 times without an acknowledgement, EIGRP checks to see if the duration of the retries has reached the hold time.

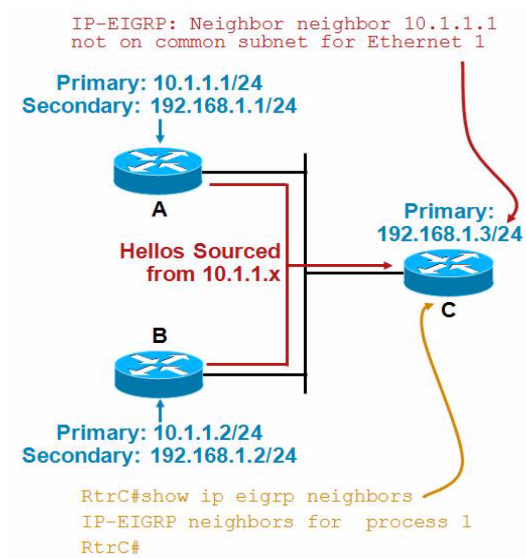
Since the hold time is typically 15 sec on anything but low-speed nonbroadcast multiple access network (NBMA), it is not a normal factor in the retry limit; NBMA links that are T1 or less, however, wait an additional period of time after re-trying 16 times, until the hold-time period (180 seconds) has been reached before declaring a neighbor down due to retry limit exceeded.

This was done to give the low-speed NBMA networks every possible chance to get the Acks across before downing the neighbor.

Ping the neighbor's unicast address. Vary the packet size and try large numbers of packets. This ping can be issued from either neighbor; the results should be the same.

Primary/Secondary Mismatch

How to troubleshoot when the primary and secondary IP address mismatch?



EIGRP always sources packets from the primary interface address. If a router receives an EIGRP packet with a source address not on the subnet for that interface, the following happens:

- The adjacency is not formed.
- The receiving router prints log messages indicating the mismatch.

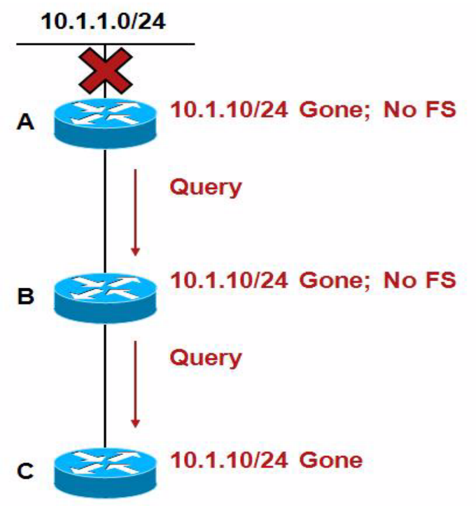
Make sure that the primary IP addresses match; i.e., are part of the same subnet

EIGRP will accept hellos that are sourced from an address that is a member of the secondary subnet; in the example above, Router A and Router B accepts the hello from Router C, since the 192.168.1.3 address falls in the subnet covered by their secondary addresses.

If the source is from an address that does not exist on the interface, neighbors will not form; in the example above, the hellos from Router A and Router B are sourced from 10.1.1.1 and 10.1.1.2, and when Router C evaluates the received hello, it will find that the sources are not on its only subnet on that interface, and the hellos are rejected.

Active Process

What happens if there is no feasible successor when a router loses its path to a destination?



a) Router A loses its route to 10.1.1.0/24.

1) Mark route active as there is no feasible successor

2) Set a 1.5 minute active timer

3) Query all neighbors (Router B)

b) Now router B receives router A's query

1) Mark route active as there is no feasible successor

2) Set 1.5 minute active timer

3) Query all neighbors (C)

c) Now router C receives router B's query

1) Examine local topology table

2) No feasible successors

3) No neighbors to query

The normal, converged state of routes in EIGRP is known as passive. When a route goes active, it means that EIGRP no longer has a known-good loop-free path for that destination and must actively look for a path to it. This happens when the route goes down or increases in metric so that the best path is no longer feasible. When a route goes active, EIGRP sends queries to all neighbors and sets a 1.5 minute timer.

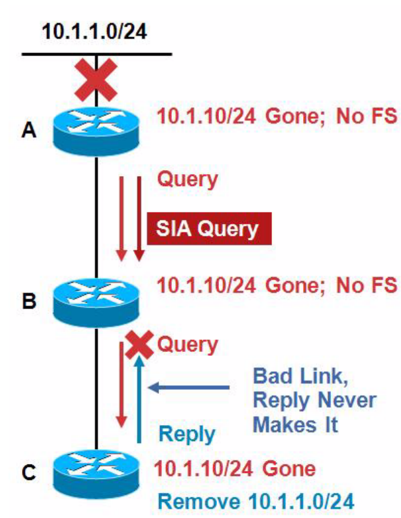
Since router C doesn't have any other neighbors to ask, it deletes the prefix that was active from both the topology table and routing table, then sends a reply to router B notifying it that it doesn't have a path to the destination

When router B receives replies to all of its queries (in this case only from router C), router B removes the prefix from its topology table and routing table; and send a reply to router A notifying that the router B does not have a path to the destination.

When router A receives replies to all of its queries (from router B) and none of the replies contained an alternative path to the destination, router A removes the prefix from its topology table and routing table.

The network is now converged on the new information

SIA Query Process



What happens if router B does not reply to router A within 1.5 minutes (the active timer)?

1) Router A sends an SIA query

If router B responds to the SIA query with an SIA reply, router A resets its timer, and the routers A/B neighbor relationship stays up.

2) Router B's relationship with router C fails at some point

This clears the query from router B's point of view

Router B replies to router A.

Sometimes the active process doesn't complete normally. If router B does not respond to router A within 1.5 minutes because it's waiting for a reply from router C, router A will send an SIA-query to router B checking the status.

If router B is still waiting on answer itself, it will respond to router A with an SIA-reply. This resets the SIA timer on router A so it will wait another 1.5 minutes.

Troubleshooting the Stuck Part of SIAs

Use **show ip eigrp topology active** command to troubleshoot the stuck part of SIAs. The output of this command provides information about routes that are in transition.

Causes for Stuck-in-Active

The following list provides the causes for SIA:

- Bad or congested links
- Query range is "too long"
- Excessive redundancy

- Overloaded router (high CPU)
- Router memory shortage
- Software defects

Minimizing SIA Routes / Decreasing Query Scope

You can minimize SIA route by following methods:

- Summarization—auto-summary (seldom used) or manual summary to summarize within a major network or to summarize external routes
- Distribute-lists—used to limit knowledge of routes; particularly on dual-homed remotes, which tend to reflect all routes back to the other leg of the dual home connection
- Use hierarchy—if the network doesn't have hierarchy, the two techniques above cannot adequately be used
- Define spoke/edge routers as stubs so they aren't queried at all

Using show commands

The **show ip eigrp traffic** displays the number of Enhanced Interior Gateway Routing Protocol (EIGRP) packets sent and received.

```
Router# show ip eigrp traffic
EIGRP-IPv4 Traffic Statistics for AS(100)
  Hellos sent/received: 136/136
  Updates sent/received: 1/4
  Queries sent/received: 0/0
  Replies sent/received: 0/0
  Acks sent/received: 3/0
  SIA-Queries sent/received: 0/0
  SIA-Replies sent/received: 0/0
  Hello Process ID: 164
  PDM Process ID: 163
  Socket Queue: 0/2000/2/0 (current/max/highest/drops)
  Input Queue: 0/2000/2/0 (current/max/highest/drops)
```

The following table describes the significant fields shown in the display.

Table 1 show ip eigrp traffic Field Descriptions

Field	Description
Hellos sent/received	Number of hello packets sent and received.
Updates sent/received	Number of update packets sent and received.
Queries sent/received	Number of query packets sent and received.
Replies sent/received	Number of reply packets sent and received.
Acks sent/received	Number of acknowledgement packets sent and received.
SIA-Queries sent/received	Number of stuck in active query packets sent and received.
SIA-Replies sent/received	Number of stuck in active reply packets sent and received.
Hello Process ID	Hello process identifier.
PDM Process ID	Protocol-dependent module IOS process identifier.
Socket Queue	The IP to EIGRP Hello Process socket queue counters.
Input queue	The EIGRP Hello Process to EIGRP PDM socket queue counters.

The **show ip eigrp interfaces details** displays information about interfaces that are configured for EIGRP.

The following is sample output that displays detailed information about all active EIGRP interfaces:

```
Router# show ip eigrp interfaces detail

EIGRP-IPv4 Interfaces for AS(1)
                        Xmit Queue   Mean   Pacing Time   Multicast    Pending
Interface        Peers  Un/Reliable  SRTT   Un/Reliable   Flow Timer   Routes
Et0/0              0        0/0         0       0/1            0           0
  Hello-interval is 7, Hold-time is 21
  Split-horizon is disabled
  Next xmit serial <none>
  Un/reliable mcasts: 0/0  Un/reliable ucasts: 0/0
  Mcast exceptions: 0  CR packets: 0  ACKs suppressed: 0
  Retransmissions sent: 0  Out-of-sequence rcvd: 0
  Next-hop-self disabled, next-hop info forwarded
  Topology-ids on interface - 0
  Authentication mode is md5,  key-chain is "TEST"
  BFD is enabled

Et0/1              0        0/0         0       0/10            0           0
  Hello-interval is 5, Hold-time is 15
  Split-horizon is enabled
```

The following table describes the significant fields shown in the display.

Table 2 show ip eigrp interfaces Field Descriptions

Field	Description
Interface	Interface over which EIGRP is configured.
Peers	Number of directly connected EIGRP neighbors.
Xmit Queue Un/Reliable	Number of packets remaining in the Unreliable and Reliable transmit queues.
Mean SRTT	Mean smooth round-trip time (SRTT) interval (in seconds).
Pacing Time Un/Reliable	Pacing time (in seconds) used to determine when EIGRP packets should be sent out the interface (unreliable and reliable packets).
Multicast Flow Timer	Maximum number of seconds for which the router will send multicast EIGRP packets.
Pending Routes	Number of routes in the packets in the transmit queue waiting to be sent.
BFD is...	BFD enable state.

The **show ip eigrp neighbors** command display the neighbors discovered by EIGRP.

The following is sample output from the **show ip eigrp neighbors** command:

```
Router# show ip eigrp neighbors

H   Address                 Interface       Hold Uptime   SRTT   RTO  Q  Seq
                                            (sec)         (ms)       Cnt Num
0   10.1.1.2                 Et0/0             13 00:00:03 1996   5000  0  5
2   10.1.1.9                 Et0/0             14 00:02:24   206   5000  0  5
1   10.1.2.3                 Et0/1             11 00:20:39   2202  5000  0  5
```

The following table describes the significant fields shown in the display.

Table 3 show ip eigrp neighbors Field Descriptions

Field	Description
AS(60)	Autonomous system number for these neighbors.
Address	IP address of the EIGRP peer.
Interface	Interface on which the router is receiving hello packets from the peer.
Holdtime	Length of time EIGRP will wait to hear from the peer before declaring it down.
Uptime	Elapsed time (in hours:minutes: seconds) since the local router first heard from this neighbor.
Q Count	Number of EIGRP packets (update, query, and reply) that the software is waiting to send.
Seq Num	Sequence number of the last update, query, or reply packet that was received from this neighbor.
SRTT	Smooth round-trip time. This is the number of milliseconds required for an EIGRP packet to be sent to this neighbor and for the local router to receive an acknowledgment of that packet.
RTO	Retransmission timeout (in milliseconds). This is the amount of time the software waits before resending a packet from the retransmission queue to a neighbor.