

# 配置并且排除故障LISP

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## 简介

思科Locator/ID分离Protocol(LISP)更改当前IP地址语义通过创建两个新的名空间：分配到分配到组成全局路由系统。的设备的终端-主机和路由定位器的端点标识符(EIDs) (RLOCs) (主路由器)

当路由器有完全互联网路由表它时需要内存和进程利用率和LISP在减少可帮助内存utilization。

## 先决条件

思科建议您有LISP基础知识。

## 使用的组件

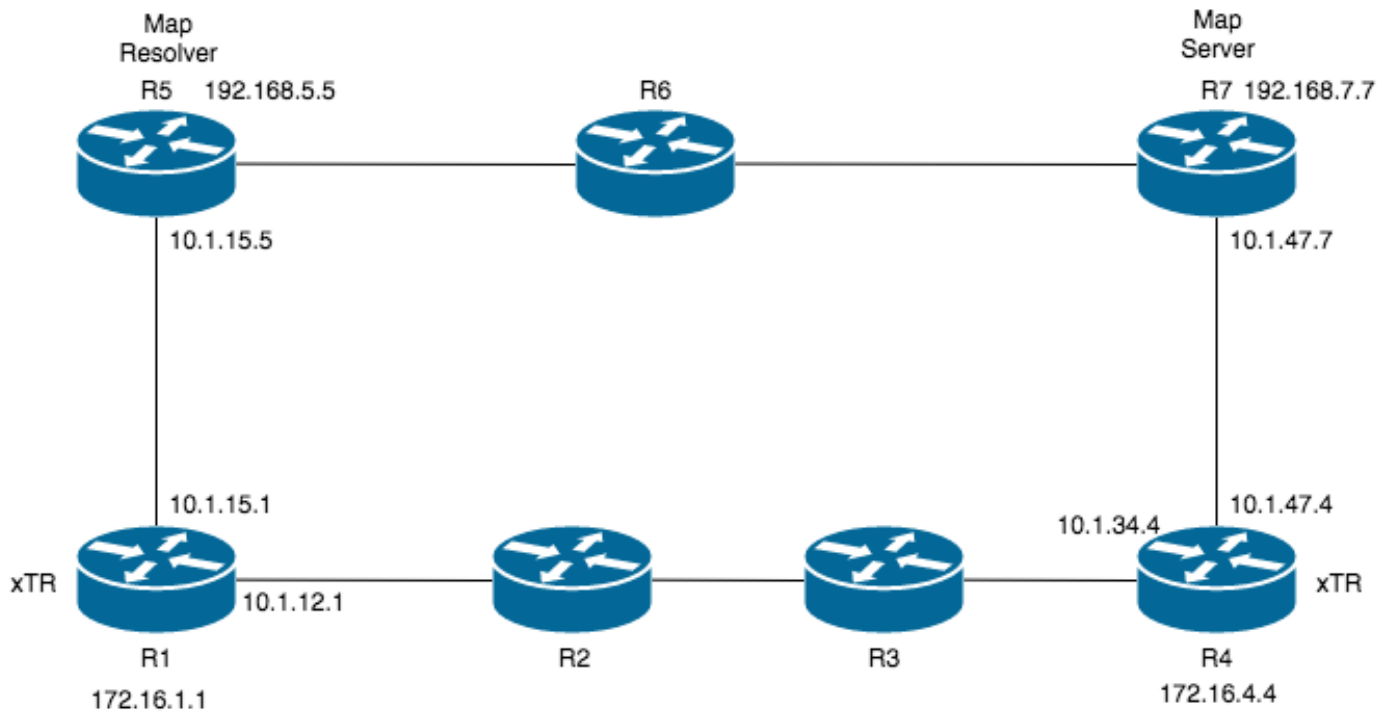
本文档不限于特定的软件和硬件版本。

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

## 配置

### 网络图

跟随的镜像将使用作为拓扑示例本文的其余：



**xTR** = A LISP路由器可以是ITR或ETR根据通信流流向。如果流量是出去LISP路由器，变为该流的ITR，并且接收端LISP路由器变为该路由器的ETR。

**ITR** = 入口通道路由器

**ETR** = 出口通道路由器

**地图解析程序(MR)** = MAP解析程序是LISP站点ITRs发送LISP Map请求查询，当解决EID对RLOC映射时的LISP基础设施。R5是在此条款的MR。

**地图服务器(MS)** = MAP服务器是LISP站点ETRs向他们的EID登记加前缀的LISP基础设施。MAP服务器通告已注册EID前缀的集合体到LISP制图系统。所有LISP站点使用LISP制图系统解决EID对RLOC映射。R7是在此条款的MS。

**端点标识符(EID)地址**：EID地址包括识别终端的IP地址和前缀。在LISP站点间的EID可接通性通过解决达到EID对RLOC映射。

**路由定位器(RLOC)地址**：RLOC地址包括识别IP网络的IP地址和前缀另外路由器。在RLOC空间内的可接通性由传统routing methods达到。

**ALT (代替逻辑拓扑)**：连接连接地图解析程序，并且地图服务器，通过通过R6，是ALT在此图表中和仅仅使用两个之间的控制层面通信。此链路从未使用在xTR之间的实际通信流。

**alt VRF**：此虚拟路由和转发(VRF)用于配置支持Locator/ID分离协议的IPv4 address-family的VRF实例(LISP)应该使用，当发送地图时为IPv4终端标识符对路由定位器请求(EID对RLOC)映射直接地在代替逻辑拓扑(ALT)

## R1设置

```
!
router lisp
database-mapping 172.16.1.1/32 10.1.12.1 priority 5 weight 100 -----> EID Mapping with RLOC
```

```

ipv4 itr map-resolver 192.168.5.5
ipv4 itr
ipv4 etr map-server 192.168.7.7 key cisco ---> ETR will send the map-register message to map
server for EID
ipv4 etr
exit
!

```

## R4设置

```

!
router lisp
database-mapping 172.16.4.4/32 10.1.34.4 priority 5 weight 100 -----> EID Mapping with RLOC
ipv4 itr map-resolver 192.168.5.5
ipv4 itr
ipv4 etr map-server 192.168.7.7 key cisco ---> ETR will send the map-register message to map
server for EID
ipv4 etr
exit
!

```

## R5 : 地图解析程序设置

在MAP解决下，其定义VRF的必须作为将用于形成并列在MR和MS之间的MPBGP和然后的alt VRF用于共享远程站点EIDs如注册对MS由xTR。

```

!
vrf definition lisp
rd 100:1
!
address-family ipv4
route-target export 100:1
route-target import 100:1
exit-address-family
!
!
interface Tunnel1
vrf forwarding lisp
ip address 10.1.45.4 255.255.255.0
tunnel source Ethernet0/1
tunnel destination 10.1.67.7
!
!
router lisp
ipv4 map-resolver
ipv4 alt-vrf lisp >>> This command defines "lisp" as the alt-vrf.
exit
!
router bgp 65000
!
address-family ipv4 vrf lisp
neighbor 10.1.45.5 remote-as 65000
neighbor 10.1.45.5 activate
exit-address-family
!

```

## R7 : MAP服务器设置

类似于MR， alt VRF在MS要求配置。

```

!
router lisp
  site 1
    authentication-key cisco
    eid-prefix 172.16.4.4/32 accept-more-specifics
  exit
!
  site 2
    authentication-key cisco
    eid-prefix 172.16.1.1/32 accept-more-specifics
  exit
!
  ipv4 map-server
  ipv4 alt-vrf lisp                >>>>>> ALT VRF is lisp
  exit
!
vrf definition lisp
  rd 100:1
  !
  address-family ipv4
    route-target export 100:1
    route-target import 100:1
  exit-address-family
!
!
interface Tunnel1
  vrf forwarding lisp
  ip address 10.1.45.5 255.255.255.0
  tunnel source Ethernet0/0
  tunnel destination 10.1.56.5
!
router bgp 65000
!
  address-family ipv4 vrf lisp
  redistribute lisp
  neighbor 10.1.45.4 remote-as 65000
  neighbor 10.1.45.4 activate
  exit-address-family
!
end

```

## 验证

为了请触发LISP通信，任一个下列的条件需要满足：

1. 应该指向默认路由在xTRs的null0。
2. 对远程xTR的EID的特定路由不应该是存在任何xTRs。

下面运算顺序：

1. 两个ETR应该传送MAP寄存器信息到他们的EIDs和RLOC地址的MAP服务器。
2. 即当从ITR的一ping到ETR从172.16.1.1完成到172.16.4.4，然后ITR 172.16.1.1将传送Map请求信息对MAP解析程序172.16.5.5，并且MAP解析程序将寄请求给在ALT拓扑的MAP服务器。
3. 一旦MS将收到从MR的请求，并且将转发同样Map请求对远程ETR。
4. 一旦ETR将接收Map请求将应答对ITR直接地与其RLOC地址。

```
R1_XTR#sh ip route 172.16.4.4 -----> R4's EID
```

```
% Subnet not in table
```

```
R1_XTR#sh ip route 0.0.0.0
Routing entry for 0.0.0.0/0, supernet
  Known via "static", distance 1, metric 0 (connected), candidate default path
  Routing Descriptor Blocks:
    * directly connected, via Null0
      Route metric is 0, traffic share count is 1
```

如上所述，路由对R4's EID : 17.16.4.4不在路由表里。反而指向往null0的默认路由由静态配置。当必要的触发情况符合，ping对17.16.4.4当前触发LISP封装。

```
R1_XTR#sh ip route 172.16.4.4 ----> R4's EID
% Subnet not in table
```

```
R1_XTR#sh ip route 0.0.0.0
Routing entry for 0.0.0.0/0, supernet
  Known via "static", distance 1, metric 0 (connected), candidate default path
  Routing Descriptor Blocks:
    * directly connected, via Null0
      Route metric is 0, traffic share count is 1
```

为了使工作上述的ping，关于目的地xTR的信息发送对R1由R4通过LISP通信：

```
R1_XTR#sh ip lisp map-cache
LISP IPv4 Mapping Cache for EID-table default (IID 0), 2 entries

0.0.0.0/0, uptime: 06:10:24, expires: never, via static send map-request
  Negative cache entry, action: send-map-request
172.16.4.4/32, uptime: 05:55:27, expires: 18:04:32, via map-reply, complete
Locator      Uptime      State      Pri/Wgt
10.1.34.4    05:55:27   up         1/100
```

## 故障排除

下面被采取的某些debug输出和数据包捕获检查LISP数据包流。在debug命令之后启用获取信息：“调试口齿控制面板全部”。

**Note:**请注释debug命令生成相当数量数据并且需要运行在受控环境。

### 在xTR- R1的调试

在下面的调试消息，R1注册其与MS和MS的EID然后确认。同样地，R4也注册其与MS的EIDs。

```
*Oct 16 12:46:09.398: LISP-0: IPv4 Map Server IID 0 192.168.7.7, Sending map-register (src_rloc
10.1.15.1) nonce 0xBEB73F0C-0xFE3EBC4E.
*Oct 16 12:46:09.403: LISP: Processing received Map-Notify message from 192.168.7.7 to 10.1.15.1
现在，ping从往R4's EID的R1启动，来源从R1的EID，并且R1立即发送一Map请求数据包对MR。
```

```
R1_XTR#ping 172.16.4.4 source 172.16.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.4.4, timeout is 2 seconds:
Packet sent with a source address of 172.16.1.1
```

```
*Oct 16 12:46:23.380: LISP: Send map request type remote EID prefix
*Oct 16 12:46:23.380: LISP: Send map request for EID prefix IID 0 172.16.4.4/32
*Oct 16 12:46:23.380: LISP-0: Remote EID IID 0 prefix 172.16.4.4/32, Send map request (1)
(sources: <signal>, state: incomplete, rlocs: 0).
*Oct 16 12:46:23.380: LISP-0: AF IPv4, Sending map-request from 10.1.12.1 to 172.16.4.4 for EID
172.16.4.4/32, ITR-RLOCs 1, nonce 0x99255979-0x30A1BAC1 (encap src 10.1.15.1, dst 192.168.5.5).
在接收数据包的MR与MS联系识别为此EID注册的xTR并且寄Map请求消息给R4。R4反回，送回
MAP回复到与其RLOC的R1：
```

```
*Oct 16 12:46:23.389: LISP: Processing received Map-Reply message from 10.1.34.4 to 10.1.12.1
*Oct 16 12:46:23.389: LISP: Received map reply nonce 0x99255979-0x30A1BAC1, records 1
*Oct 16 12:46:23.389: LISP: Processing Map-Reply mapping record for IID 0 172.16.4.4/32, ttl
1440, action none, authoritative, 1 locator
10.1.34.4 pri/wei=1/100 LpR
*Oct 16 12:46:23.389: LISP-0: Map Request IID 0 prefix 172.16.4.4/32 remote EID prefix[LL],
Received reply with rtt 9ms.
*Oct 16 12:46:23.389: LISP: Processing mapping information for EID prefix IID 0 172.16.4.4/32
```

## MAP解析程序数据包流

如下所示，MR首先收到从R1的一个Map请求消息认识172.16.4.4的RLOC。它然后检查其BGP口  
齿VRF表在学习的EIDs的一匹配从MS，并且在查找匹配MR寄Map请求给MS：

```
LISP_Resolver#show ip bgp vpnv4 vrf lisp
```

```
BGP table version is 3, local router ID is 192.168.5.5
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
   Network          Next Hop          Metric LocPrf Weight Path
Route Distinguisher: 100:1 (default for vrf lisp)
*>i 172.16.1.1/32    10.1.45.5         1     100     0 ?
*>i 172.16.4.4/32    10.1.45.5         1     100     0 ?
```

```
*Oct 16 12:46:23.384: LISP: Processing received Map-Request message from 10.1.12.1 to 172.16.4.4
*Oct 16 12:46:23.384: LISP: Received map request for IID 0 172.16.4.4/32, source_eid IID 0
172.16.1.1, ITR-RLOCs: 10.1.12.1, records 1, nonce 0x99255979-0x30A1BAC1
*Oct 16 12:46:23.384: LISP-0: AF IID 0 IPv4, Forwarding map request to 172.16.4.4 on the ALT.
```

**Note:**即使日志消息说Map请求转发对172.16.4.4在BGP表里实际上发送对MS根据下个跳越条  
目。

## MAP服务器数据包流

在MS的调试运行表示首先来自R1和R4的MAP寄存器消息注册他们的各自ETRs：

```
*Oct 16 12:46:09.398: LISP: Processing Map-Register mapping record for IID 0 172.16.1.1/32, ttl
```

```
1440, action none, authoritative, 1 locator
10.1.12.1 pri/wei=5/100 LpR
*Oct 16 12:46:09.398: LISP-0: MS registration IID 0 prefix 172.16.1.1/32 10.1.15.1 site 2,
Updating.
*Oct 16 12:46:41.445: LISP: Processing Map-Register mapping record for IID 0 172.16.4.4/32, ttl
1440, action none, authoritative, 1 locator
10.1.34.4 pri/wei=1/100 LpR
*Oct 16 12:46:41.445: LISP-0: MS registration IID 0 prefix 172.16.4.4/32 10.1.47.4 site 1,
Updating.
```

现在，两xTRs顺利地注册他们的EIDs：

#### R7#show lisp site detail

LISP Site Registration Information

##### Site name: 1

Allowed configured locators: any

Allowed EID-prefixes:

##### EID-prefix: 172.16.4.4/32

```
First registered:    05:02:48    Routing table tag:    0
Origin:             Configuration, accepting more specifics
Merge active:       No
Proxy reply:        No
TTL:                1d00h
State:              complete
```

Registration errors:

```
Authentication failures: 0
Allowed locators mismatch: 0
```

```
ETR 10.1.47.4, last registered 00:00:21, no proxy-reply, map-notify
TTL 1d00h, no merge, hash-function sha1, nonce 0x56D89121-0xC39C2892
state complete, no security-capability
xTR-ID 0xF7DE6C93-0x06F8DDA4-0x7D6400B1-0x19EC9669
site-ID unspecified
```

Locator	Local	State	Pri/Wgt
10.1.34.4	yes	up	1/100

##### Site name: 2

Allowed configured locators: any

Allowed EID-prefixes:

##### EID-prefix: 172.16.1.1/32

```
First registered:    05:02:46
Routing table tag:    0
Origin:             Configuration, accepting more specifics
Merge active:       No
Proxy reply:        No
TTL:                1d00h
State:              complete
```

Registration errors:

```
Authentication failures: 0
Allowed locators mismatch: 0
```

```
ETR 10.1.15.1, last registered 00:00:50, no proxy-reply, map-notify
TTL 1d00h, no merge, hash-function sha1, nonce 0xBEB73F0C-0xFE3EBC4E
state complete, no security-capability
xTR-ID 0xCF7E1300-0x302FF91A-0x1C2D0499-0x8A105258
site-ID unspecified
```

Locator	Local	State	Pri/Wgt
10.1.12.1	yes	up	5/100

当ping从R1和MR执行传送Map请求信息对MS时，以下日志在MS能被看到：

#### R7#show lisp site detail

LISP Site Registration Information

##### Site name: 1

Allowed configured locators: any

Allowed EID-prefixes:

**EID-prefix: 172.16.4.4/32**

First registered: 05:02:48 Routing table tag: 0  
Origin: Configuration, accepting more specifics  
Merge active: No  
Proxy reply: No  
TTL: 1d00h  
State: complete

Registration errors:

Authentication failures: 0  
Allowed locators mismatch: 0

**ETR 10.1.47.4**, last registered 00:00:21, no proxy-reply, map-notify  
TTL 1d00h, no merge, hash-function sha1, nonce 0x56D89121-0xC39C2892  
state complete, no security-capability  
xTR-ID 0xF7DE6C93-0x06F8DDA4-0x7D6400B1-0x19EC9669  
site-ID unspecified

Locator	Local	State	Pri/Wgt
<b>10.1.34.4</b>	yes	up	1/100

**Site name: 2**

Allowed configured locators: any

Allowed EID-prefixes:

**EID-prefix: 172.16.1.1/32**

First registered: 05:02:46  
Routing table tag: 0  
Origin: Configuration, accepting more specifics  
Merge active: No  
Proxy reply: No  
TTL: 1d00h  
State: complete

Registration errors:

Authentication failures: 0  
Allowed locators mismatch: 0

**ETR 10.1.15.1**, last registered 00:00:50, no proxy-reply, map-notify  
TTL 1d00h, no merge, hash-function sha1, nonce 0xBEB73F0C-0xFE3EBC4E  
state complete, no security-capability  
xTR-ID 0xCF7E1300-0x302FF91A-0x1C2D0499-0x8A105258  
site-ID unspecified

Locator	Local	State	Pri/Wgt
<b>10.1.12.1</b>	yes	up	5/100

## xTR2-R4数据包流

跟随事件在R4发生：

1. 即R4收到从R7 MS的一个LISP被封装的消息。
2. 数据包被解封装和被发现同样Map请求即最新转发的对从MR的MS的R1及早发送对R5 MS。
3. R4然后传送MAP回复信息直接地对R1。

```
*Oct 16 13:32:40.700: LISP: Processing received Encap-Control message from 10.1.47.7 to 10.1.34.4
*Oct 16 13:32:40.702: LISP: Processing received Map-Request message from 10.1.12.1 to 172.16.4.4
*Oct 16 13:32:40.702: LISP: Received map request for IID 0 172.16.4.4/32, source_eid IID 0 172.16.1.1, ITR-RLOCs: 10.1.12.1, records 1, nonce 0x188823A0-0xAFF029C8
*Oct 16 13:32:40.702: LISP: Processing map request record for EID prefix IID 0 172.16.4.4/32
*Oct 16 13:32:40.702: LISP-0: Sending map-reply from 10.1.34.4 to 10.1.12.1.
```

## 数据包捕获

在MR



## 在数据包捕获之下是为Map请求来自R4的R1 :

```
Internet Protocol Version 4, Src: 10.1.15.1 (10.1.15.1), Dst: 192.168.5.5 (192.168.5.5)
  Version: 4
  Header Length: 20 bytes
  Differentiated Services Field: 0xc0 (DSCP 0x30: Class Selector 6; ECN: 0x00: Not-ECT (Not
ECN-Capable Transport))
  Total Length: 120
  Identification: 0x1446 (5190)
  Flags: 0x00
  Fragment offset: 0
  Time to live: 31
  Protocol: UDP (17)
  Header checksum: 0xa7c0 [validation disabled]
  Source: 10.1.15.1 (10.1.15.1)
  Destination: 192.168.5.5 (192.168.5.5)
  [Source GeoIP: Unknown]
  [Destination GeoIP: Unknown]
User Datagram Protocol, Src Port: 4342 (4342), Dst Port: 4342 (4342)
Locator/ID Separation Protocol
Internet Protocol Version 4, Src: 10.1.12.1 (10.1.12.1), Dst: 172.16.4.4 (172.16.4.4)
  Version: 4
  Header Length: 20 bytes
  Differentiated Services Field: 0xc0 (DSCP 0x30: Class Selector 6; ECN: 0x00: Not-ECT (Not
ECN-Capable Transport))
  Total Length: 88
  Identification: 0x1445 (5189)
  Flags: 0x00
  Fragment offset: 0
  Time to live: 32
  Protocol: UDP (17)
  Header checksum: 0xbf7a [validation disabled]
  Source: 10.1.12.1 (10.1.12.1)
  Destination: 172.16.4.4 (172.16.4.4)
  [Source GeoIP: Unknown]
  [Destination GeoIP: Unknown]
User Datagram Protocol, Src Port: 4342 (4342), Dst Port: 4342 (4342)
Locator/ID Separation Protocol
```

## 在MS

## MAP寄存器数据包如下捕获 :

```
Internet Protocol Version 4, Src: 10.1.47.4 (10.1.47.4), Dst: 192.168.7.7 (192.168.7.7)
User Datagram Protocol, Src Port: 4342 (4342), Dst Port: 4342 (4342)
Locator/ID Separation Protocol
  0011 .... = Type: Map-Register (3)
  .... 0... = P bit (Proxy-Map-Reply): Not set
  .... .0.. = S bit (LISP-SEC capable): Not set
  .... ..1. = I bit (xTR-ID present): Set
  .... ...0 = R bit (Built for an RTR): Not set
  .... .... 0000 0000 0000 000. = Reserved bits: 0x000000
  .... .... .... .... .... ..1 = M bit (Want-Map-Notify): Set
Record Count: 1
Nonce: 0x56d89121c39c2892
Key ID: 0x0001
Authentication Data Length: 20
Authentication Data: ce8f37f14c76d49e52717d1c5407e638e2733015
Mapping Record 1, EID Prefix: 172.16.4.4/32, TTL: 1440, Action: No-Action, Authoritative
Record TTL: 1440
```

```
Locator Count: 1
EID Mask Length: 32
000. .... = Action: No-Action (0)
...1 .... = Authoritative bit: Set
.... .000 0000 0000 = Reserved: 0x0000
0000 .... = Reserved: 0x0000
.... 0000 0000 0000 = Mapping Version: 0
EID Prefix AFI: IPv4 (1)
EID Prefix: 172.16.4.4 (172.16.4.4)
Locator Record 1, Local RLOC: 10.1.34.4, Reachable, Priority/Weight: 1/100, Multicast
Priority/Weight: 255/0
xTR-ID: f7de6c9306f8dda47d6400b119ec9669
Site-ID: 0000000000000000
```

## 在R1

### 在R1捕获的MAP回复消息接收从R4

```
Internet Protocol Version 4, Src: 10.1.34.4 (10.1.34.4), Dst: 10.1.12.1 (10.1.12.1)
User Datagram Protocol, Src Port: 4342 (4342), Dst Port: 4342 (4342)
Locator/ID Separation Protocol
0010 .... = Type: Map-Reply (2)
.... 0... = P bit (Probe): Not set
.... .0.. = E bit (Echo-Nonce locator reachability algorithm enabled):
Not set
.... ..0. = S bit (LISP-SEC capable): Not set
.... ...0 0000 0000 0000 0000 = Reserved bits: 0x000000
Record Count: 1
Nonce: 0xe9ee73f07b0cb7d6
Mapping Record 1, EID Prefix: 172.16.4.4/32, TTL: 1440, Action: No-Action, Authoritative
Record TTL: 1440
Locator Count: 1
EID Mask Length: 32
000. .... = Action: No-Action (0)
...1 .... = Authoritative bit: Set
.... .000 0000 0000 = Reserved: 0x0000
0000 .... = Reserved: 0x0000
.... 0000 0000 0000 = Mapping Version: 0
EID Prefix AFI: IPv4 (1)
EID Prefix: 172.16.4.4 (172.16.4.4)
Locator Record 1, Local RLOC: 10.1.34.4, Reachable, Priority/Weight: 1/100, Multicast
Priority/Weight: 255/0
```