

配置在连结的LISP多跳跃移动性

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简介

本文描述配置，并且在定位器标识分离协议IP设备的验证(LISP)的数据中心间移动启用网络，无需更改其IP地址。在LISP环境此设备呼叫Dynamic EID。LISP多跳跃移动性支持允许不同的数据Centers(DC)有相同子网inturn允许VMs保持他们的指定的IP地址，当移植到另一个数据中心时的子网扩展模式。

第一跳跃路由器(FHR)检测动态EID出现并且通知同样对网关通过EID的xTR侧(端点标识符)通知消息。xTRs注册动态EID映射服务器并且执行LISP封装和解封装功能通过通过LISP域的流量的。

应该通过数据中心互连(DCI)技术连接用不同的数据中心部署的xTRs类似OTV。在连结，OTV支持组播模式。

[先决条件](#)

思科建议您有LISP基础知识。

使用的组件

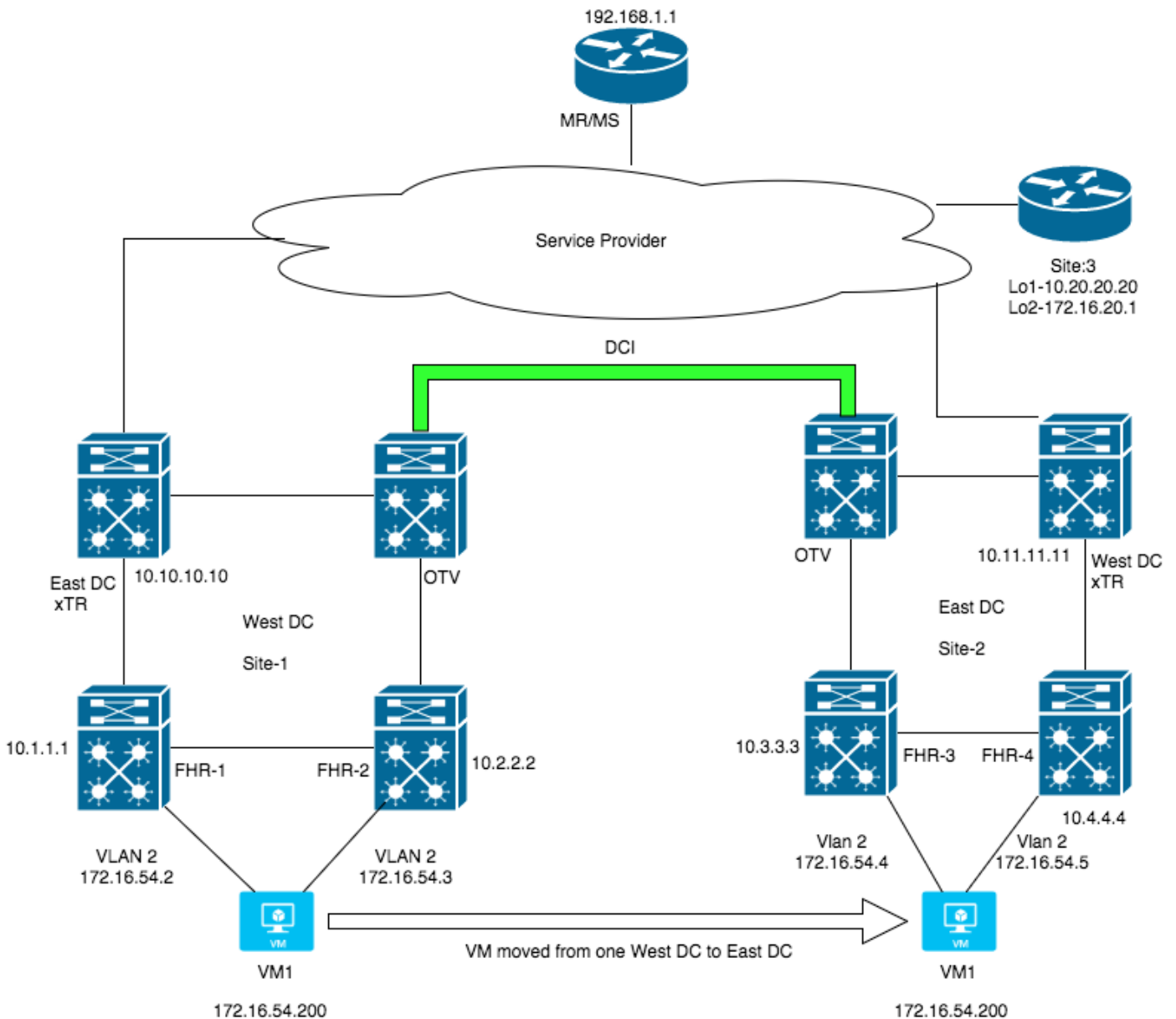
本文档不限于特定的软件和硬件版本。

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。

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

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routingmethods达到。

SMR : 请求MAP请求;用于的控制层面消息告诉远程xTRs更新他们缓存了的映射。

ASM : 在子网模式间;允许在LISP站点之间的EID移动性如果不到位Layer2分机。

MAP通知 : 在关于该发现的同一个LISP站点检测EID更新其他xTRs的xTR使用的LISP消息。它由MAP服务器也使用确认MAP寄存器接收并且处理。

MAP寄存器 : xTR用于的LISP消息注册一个EID用MAP服务器。

在此条款讨论的示例中，流量从VM (172.16.54.200)不断地流到Site-3 (172.16.20.1)。

配置

西部DC

第一跳跃路由器(FHR-1)

```
!  
feature lisp  
!  
ip lisp etr  
!  
lisp dynamic-eid VM  
  database-mapping 172.16.54.0/24 10.1.1.1 priority 10 weight 50  
  database-mapping 172.16.54.0/24 10.2.2.2 priority 10 weight 50  
  eid-notify 10.10.10.10 key 3 9125d59c18a9b015  
  map-notify-group 225.1.1.1  
!  
interface loopback0  
  ip address 10.1.1.1/32  
  ip router ospf 1 area 0.0.0.0  
!  
interface Vlan2  
  no shutdown  
  lisp mobility VM  
  lisp extended-subnet-mode  
  ip address 172.16.54.3/24  
  ip ospf passive-interface  
  ip router ospf 1 area 0.0.0.0  
  ip pim sparse-mode  
  no ip arp gratuitous request  
  hsrp 1  
    preempt  
    priority 120  
    ip 172.16.54.1
```

FHR-2

```
!  
feature lisp  
!  
ip lisp etr  
!
```

```
lisp dynamic-eid VM
database-mapping 172.16.54.0/24 10.1.1.1 priority 10 weight 50
database-mapping 172.16.54.0/24 10.2.2.2 priority 10 weight 50
eid-notify 10.10.10.10 key 3 9125d59c18a9b015
map-notify-group 225.1.1.1
!
interface Vlan2
no shutdown
lisp mobility VM
  lisp extended-subnet-mode
ip address 172.16.54.2/24
ip ospf passive-interface
ip pim sparse-mode
no ip arp gratuitous request
hsrp 1
  preempt
  priority 90
  ip 172.16.54.1
!
interface loopback0
ip address 10.2.2.2/32
ip router ospf 1 area 0.0.0.0
```

xTR

```
!
feature lisp
!
ip lisp etr
!
lisp dynamic-eid VM
database-mapping 172.16.54.0/24 10.1.1.1 priority 10 weight 50
database-mapping 172.16.54.0/24 10.2.2.2 priority 10 weight 50
eid-notify 10.10.10.10 key 3 9125d59c18a9b015
map-notify-group 225.1.1.1
!
interface Vlan2
no shutdown
lisp mobility VM
  lisp extended-subnet-mode
ip address 172.16.54.2/24
ip ospf passive-interface
ip pim sparse-mode
no ip arp gratuitous request
hsrp 1
  preempt
  priority 90
  ip 172.16.54.1
!
interface loopback0
ip address 10.2.2.2/32
ip router ospf 1 area 0.0.0.0
```

东方DC

FHR-3

```
!
feature lisp
!
ip lisp etr
```

```
!  
lisp dynamic-eid VM  
  database-mapping 172.16.54.0/24 10.3.3.3 priority 10 weight 50  
  database-mapping 172.16.54.0/24 10.4.4.4 priority 10 weight 50  
  eid-notify 10.11.11.11 key 3 9125d59c18a9b015  
  map-notify-group 225.1.1.1  
!  
interface Vlan2  
  no shutdown  
  lisp mobility VM  
    lisp extended-subnet-mode  
  ip address 172.16.54.4/24  
  ip ospf passive-interface  
  ip router ospf 1 area 0.0.0.0  
  ip pim sparse-mode  
  no ip arp gratuitous request  
  hsrp 1  
    preempt  
    priority 110  
    ip 172.16.54.1  
!  
interface loopback0  
  ip address 10.3.3.3/32  
  ip router ospf 1 area 0.0.0.0
```

FHR-4

```
!  
feature lisp  
!  
ip lisp etr  
!  
lisp dynamic-eid VM  
  database-mapping 172.16.54.0/24 10.3.3.3 priority 10 weight 50  
  database-mapping 172.16.54.0/24 10.4.4.4 priority 10 weight 50  
  eid-notify 10.11.11.11 key 3 9125d59c18a9b015  
  map-notify-group 225.1.1.1  
!  
interface Vlan2  
  no shutdown  
  lisp mobility VM  
    lisp extended-subnet-mode  
  ip pim sparse-mode  
ip ospf passive-interface  
  ip address 172.16.54.5/24  
  hsrp 1  
    preempt  
    priority 90  
    ip 172.16.54.1  
!  
interface loopback0  
  ip address 10.4.4.4/32  
  ip router ospf 1 area 0.0.0.0
```

xTR

```
!  
feature lisp  
!  
ip lisp etr  
!  
lisp dynamic-eid VM
```

```
database-mapping 172.16.54.0/24 10.3.3.3 priority 10 weight 50
database-mapping 172.16.54.0/24 10.4.4.4 priority 10 weight 50
eid-notify 10.11.11.11 key 3 9125d59c18a9b015
map-notify-group 225.1.1.1
!
interface Vlan2
no shutdown
lisp mobility VM
  lisp extended-subnet-mode
  ip pim sparse-mode
ip ospf passive-interface
ip address 172.16.54.5/24
hsrp 1
  preempt
  priority 90
  ip 172.16.54.1
!
interface loopback0
ip address 10.4.4.4/32
ip router ospf 1 area 0.0.0.0
```

MS/MR

```
!
feature lisp
!
ip lisp etr
!
lisp dynamic-eid VM
database-mapping 172.16.54.0/24 10.3.3.3 priority 10 weight 50
database-mapping 172.16.54.0/24 10.4.4.4 priority 10 weight 50
eid-notify 10.11.11.11 key 3 9125d59c18a9b015
map-notify-group 225.1.1.1
!
interface Vlan2
no shutdown
lisp mobility VM
  lisp extended-subnet-mode
  ip pim sparse-mode
ip ospf passive-interface
ip address 172.16.54.5/24
hsrp 1
  preempt
  priority 90
  ip 172.16.54.1
!
interface loopback0
ip address 10.4.4.4/32
ip router ospf 1 area 0.0.0.0
```

Site-3

```
!
feature lisp
!
ip lisp etr
!
lisp dynamic-eid VM
database-mapping 172.16.54.0/24 10.3.3.3 priority 10 weight 50
database-mapping 172.16.54.0/24 10.4.4.4 priority 10 weight 50
eid-notify 10.11.11.11 key 3 9125d59c18a9b015
```

```

map-notify-group 225.1.1.1
!
interface Vlan2
no shutdown
lisp mobility VM
  lisp extended-subnet-mode
  ip pim sparse-mode
ip ospf passive-interface
ip address 172.16.54.5/24
hsrp 1
  preempt
  priority 90
  ip 172.16.54.1
!
interface loopback0
ip address 10.4.4.4/32
ip router ospf 1 area 0.0.0.0

```

运算顺序

步骤 1：VM启动。

即VM启动和开始发送流量对远程站点Site-3。FHR-1将接收此数据流，并且请创建动态EID。

```
N7K-358-West-FHR1# show lisp dynamic-eid summary
```

```
LISP Dynamic EID Summary for VRF "default"
```

```
* = Dyn-EID learned by site-based Map-Notify
```

```
! = Dyn-EID learned by routing protocol
```

```
^ = Dyn-EID learned by EID-Notify
```

| Dyn-EID Name | Dynamic-EID | Interface | Uptime | Last Packet | Pending Ping Count |
|--------------|---------------|-----------|----------|-------------|--------------------|
| VM | 172.16.54.200 | Vlan2 | 06:50:21 | 00:12:12 | 0 |

```
N7K-358-West-FHR1# show lisp dynamic-eid detail
```

```
LISP Dynamic EID Information for VRF "default"
```

```
Dynamic-EID name: VM
```

```
Database-mapping [0] EID-prefix: 172.16.54.0/24, LSBs: 0x00000003
```

```
Locator: 10.1.1.1, priority: 10, weight: 50
```

```
Uptime: 06:51:34, state: up, local
```

```
Locator: 10.2.2.2, priority: 10, weight: 50
```

```
Uptime: 06:50:10, state: up
```

```
Registering more-specific dynamic-EIDs
```

```
Registering routes: disabled
```

```
Map-Server(s): none configured, use global Map-Server
```

```
Site-based multicast Map-Notify group: 225.1.1.1
```

```
Extended Subnet Mode configured on 1 interfaces
```

```
Number of roaming dynamic-EIDs discovered: 3
```

```
Last dynamic-EID discovered: 172.16.54.1, 00:00:04 ago
```

```
Roaming dynamic-EIDs:
```

```
172.16.54.200, Vlan2, uptime: 06:50:31, last activity: 00:12:22
```

```
Discovered by: packet reception
```

步骤 2：FHR安装LISP路由

如step1所显示，FHR创建在接收数据包的一个动态EID条目从VM。它然后安装在RIB的一个/32路由：

```
N7K-358-FHR1-West-DC# show ip route 172.16.54.200
```

```
IP Route Table for VRF "default"
```

```
'*' denotes best ucast next-hop
```

'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

```
172.16.54.200/32, ubest/mbest: 1/0, attached
  *via 172.16.54.200, Vlan2, [240/0], 06:58:08, lisp, dyn-eid
    via 172.16.54.200, Vlan2, [250/0], 06:58:45, am
```

步骤 3：FHR通知关于此动态EID的其他FHRs

此FHR在本地站点将发送MAP通知消息对其他FHRs包括那个以及在所有远程站点。在我们的示例中，FHR-1发送关于172.16.54.200的MAP通知对在本地DC以及FHR-3和FHR-4的FHR-2在东方DC。

但是仅本地站点FHR将是安装该EID的路由在其RIB如下所示：

```
N7K-358-FHR2-West-DC# show lisp dynamic-eid detail
LISP Dynamic EID Information for VRF "default"
Dynamic-EID name: VM
Database-mapping [0] EID-prefix: 172.16.54.0/24, LSBs: 0x00000003
Locator: 10.1.1.1, priority: 10, weight: 50
Uptime: 00:01:04, state: up
Locator: 10.2.2.2, priority: 10, weight: 50
Uptime: 00:01:53, state: up, local
Registering more-specific dynamic-EIDs
Registering routes: disabled
Map-Server(s): none configured, use global Map-Server
Site-based multicast Map-Notify group: 225.1.1.1
Extended Subnet Mode configured on 1 interfaces
Number of roaming dynamic-EIDs discovered: 1
Last dynamic-EID discovered: 172.16.54.200, 00:01:04 ago
Roaming dynamic-EIDs:
172.16.54.200, Vlan2, uptime: 00:01:04, last activity: 00:00:42
  Discovered by: site-based Map-Notify
Secure-handoff pending for sources: none
```

```
N7K-358-FHR2-West-DC#sh ip route 172.16.54.200
IP Route Table for VRF "default"
 '*' denotes best ucast next-hop
 '**' denotes best mcast next-hop
 '[x/y]' denotes [preference/metric]
 '%<string>' in via output denotes VRF <string>
172.16.54.200/32, ubest/mbest: 1/0, attached
 *via 172.16.54.200, Vlan2, [240/0], 00:00:08, lisp, dyn-eid
   via 172.16.54.200, Vlan2, [250/0], 00:01:53, am
```

步骤 4：FHR更新此EID对本地xTR

FHR在知道关于EID通知他们的关于此EID的本地站点的xTR使用的两个站点EID通知消息。

东部DC xTR路由器也将安装此前缀的一个null0路由，而西方DC xTR将添加在RIB的此前缀。

```
N7K-FA8-East_xTR#show ip route 172.16.54.200
IP Route Table for VRF "default"
 '*' denotes best ucast next-hop
 '**' denotes best mcast next-hop
```


'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

```
172.16.54.200/32, ubest/mbest: 1/0, attached
  *via 172.16.54.200, Null0, [241/0], 00:00:32, lisp, dyn-eid
```

N7K-358-West_xTR#show lisp dynamic-eid detail

```
LISP Dynamic EID Information for VRF "default"
Dynamic-EID name: VM
Database-mapping [0] EID-prefix: 172.16.54.0/24, LSBs: 0x00000001
Locator: 10.10.10.10, priority: 10, weight: 50
Uptime: 00:02:37, state: up, local
Registering more-specific dynamic-EIDs
Registering routes: disabled
Map-Server(s): none configured, use global Map-Server
Site-based multicast Map-Notify group: none configured
Number of roaming dynamic-EIDs discovered: 1
Last dynamic-EID discovered: 172.16.54.1, 00:00:06 ago
Roaming dynamic-EIDs:
172.16.54.200, (null), uptime: 00:00:28, last activity: 00:00:06
Discovered by: EID-Notify
EID-Notify Locators:
10.1.1.1
10.2.2.2
```

N7K-358-West_xTR#sh ip route 172.16.54.200

```
IP Route Table for VRF "default"
'*' denotes best ucast next-hop
'***' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>
172.16.54.0/24, ubest/mbest: 1/0
via 10.10.13.3, Eth3/2, [110/44], 00:01:00, ospf-1, intra
```

本地xTR将注册与MR/MS的EID :

东部DC xTR也将传送MAP寄存器信息对MR/MS并且注册与他们的此最新发现EID。这也是可靠对于Site-3路由器。

MS_MR#show lisp site 172.16.54.200/32

```
LISP Site Registration Information

Site name: 1
Allowed configured locators: any
Requested EID-prefix:
  EID-prefix: 172.16.54.200/32
    First registered:      07:11:28
    Routing table tag:    0
    Origin:                Dynamic, more specific of 172.16.54.0/24
    Merge active:         No
    Proxy reply:          No
    TTL:                   00:03:00
    State:                 complete
Registration errors:
  Authentication failures: 0
  Allowed locators mismatch: 0
ETR 10.10.90.1, last registered 00:00:07, no proxy-reply, map-notify
  TTL 00:03:00, no merge, hash-function sha1, nonce 0x00000000-0x00000000
  state complete, no security-capability
  xTR-ID N/A
  site-ID N/A
Locator      Local State      Pri/Wgt Scope
```

```
10.10.10.10 yes up 10/50 IPv4 none
```

MS_MR#sh lisp site 172.16.20.0/24

```
LISP Site Registration Information
Site name: 2
Allowed configured locators: any
Requested EID-prefix:
EID-prefix: 172.16.20.0/24
First registered: 06:30:48
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 10.10.67.7, last registered 00:00:23, no proxy-reply, map-notify
TTL 1d00h, no merge, hash-function sha1, nonce 0xEE339164-0xC3199AF1
state complete, no security-capability
xTR-ID 0x7C6C7CF6-0x2AE64A0C-0xDCBC62DA-0x79762795
site-ID unspecified
Locator Local State Pri/Wgt Scope
10.20.20.20 yes up 10/50 IPv4 none
```

步骤 5：验证在站点1和站点3 xTRs的通信流：

N7K-358-West_xTR# show ip lisp map-cache

```
LISP IP Mapping Cache for VRF "default" (iid 0), 3 entries
* = Locator data counters are cumulative across all EID-prefixes

0.0.0.0/1, uptime: 00:13:28, expires: 00:01:31, via map-reply
Negative cache entry, action: forward-native

128.0.0.0/3, uptime: 00:13:28, expires: 00:01:31, via map-reply
Negative cache entry, action: forward-native

172.16.20.0/24, uptime: 00:00:26, expires: 23:59:33, via map-reply, auth
Locator      Uptime      State      Priority/  Data      Control      MTU
              State      Weight    in/out    in/out
10.20.20.20  00:00:26  up         10/50     0/0*     0/0          1500
```

站点3 LISP地图缓存条目

Site-3#show ip lisp map-cache

```
LISP IPv4 Mapping Cache for EID-table default (IID 0), 2 entries

0.0.0.0/0, uptime: 01:53:04, expires: never, via static send map-request
Negative cache entry, action: send-map-request
172.16.54.200/32, uptime: 01:50:02, expires: 22:09:57, via map-reply, complete
Locator      Uptime      State      Pri/Wgt
10.10.10.10  01:50:02  up         10/50
```

步骤 6：VM从西方DC搬到东方DC

在步骤上请是，在DC之间的VM迁移发生了前。现在，VM从西方DC移动向东方DC，无需更改IP地址。当VM从西方DC搬到东方DC，在东方DC的FHR-3将收到从VM的数据包，并且将添加其IP地址到动态EID表。它然后将发送MAP通知请求对所有FHR包括从动态EID表将删除VM条目的西方DC，并且，一旦西方DC接收MAP通知请求哪些创建，当VM是存在西方DC。在西方DC的xTR当前将安装null0路由对VM的IP。

下面动态EID状态在FHR-3的在东方DC:

```
N7K-FA8-East_FHR3# sh lisp dynamic-eid detail
LISP Dynamic EID Information for VRF "default"
Dynamic-EID name: VM
Database-mapping [0] EID-prefix: 172.16.54.0/24, LSBs: 0x00000003
Locator: 10.3.3.3, priority: 10, weight: 50
    Uptime: 02:04:48, state: up, local
Locator: 10.4.4.4, priority: 10, weight: 50
    Uptime: 02:03:27, state: up
Registering more-specific dynamic-EIDs
Registering routes: disabled
Map-Server(s): none configured, use global Map-Server
Site-based multicast Map-Notify group: 225.1.1.1
Extended Subnet Mode configured on 1 interfaces
Number of roaming dynamic-EIDs discovered: 1
Last dynamic-EID discovered: 172.16.54.1, 00:00:14 ago
Roaming dynamic-EIDs:
    172.16.54.200, Vlan2, uptime: 00:04:28, last activity: 00:03:11
    Discovered by: packet reception
```

```
N7K-FA8-East_FHR3# sh ip route 172.16.54.200
IP Route Table for VRF "default"
'*' denotes best ucast next-hop
'***' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

172.16.54.200/32, ubest/mbest: 1/0, attached
    *via 172.16.54.200, Vlan2, [240/0], 00:05:00, lisp, dyn-eid
    via 172.16.54.200, Vlan2, [250/0], 00:05:10, am
```

即不因此西方FHR有VM的172.16.54.200动态EID

```
N7K-358-West-FHR1(config)# sh lisp dynamic-eid summary
LISP Dynamic EID Summary for VRF "default"
* = Dyn-EID learned by site-based Map-Notify
! = Dyn-EID learned by routing protocol
^ = Dyn-EID learned by EID-Notify
Dyn-EID Name    Dynamic-EID    Interface    Uptime    Last    Pending
                172.16.54.2    Vlan2        00:33:30  00:00:07  0
                Packet    Ping Count
```

步骤 7：在西方DC的xTR在路由表里将添加null0条目。

```
N7K-358-West_xTR# sh ip route 172.16.54.200
IP Route Table for VRF "default"
'*' denotes best ucast next-hop
'***' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

172.16.54.200/32, ubest/mbest: 1/0, attached
    *via 172.16.54.200, Null0, [241/0], 00:00:05, lisp, dyn-eid
```

步骤 8:东部xTR将由FHR-3更新通过EID通知，并且东部xTR然后将发送MAP寄存器对与被移植的VM的前缀的MS

```

N7K-FA8-East_xTR(config)# show lisp dynamic-eid Detail
LISP Dynamic EID Information for VRF "default"
Dynamic-EID name: VM
Database-mapping [0] EID-prefix: 172.16.54.0/24, LSBs: 0x00000001
Locator: 10.11.11.11, priority: 9, weight: 50
Uptime: 02:19:51, state: up, local
Registering more-specific dynamic-EIDs
Registering routes: disabled
Map-Server(s): none configured, use global Map-Server
Site-based multicast Map-Notify group: none configured
Number of roaming dynamic-EIDs discovered: 1
Last dynamic-EID discovered: 172.16.54.1, 00:00:58 ago
Roaming dynamic-EIDs:
  172.16.54.200, (null), uptime: 00:17:50, last activity: 00:00:25
    Discovered by: EID-Notify
    EID-Notify Locators:
      10.3.3.3
      10.4.4.4

```

```

MS_MR#sh lisp site 172.16.54.200
LISP Site Registration Information
Site name: 1
Allowed configured locators: any
Requested EID-prefix:
EID-prefix: 172.16.54.200/32
First registered:      02:02:24
Routing table tag:    0
Origin:               Dynamic, more specific of 172.16.54.0/24
Merge active:         No
Proxy reply:          No
TTL:                  00:03:00
State:                complete
Registration errors:
  Authentication failures: 0
  Allowed locators mismatch: 0
ETR 10.11.17.1, last registered 00:00:32, no proxy-reply, map-notify
  TTL 00:03:00, no merge, hash-function sha1, nonce 0x00000000-0x00000000
  state complete, no security-capability
  xTR-ID N/A
  site-ID N/A
Locator   Local State   Pri/Wgt Scope
10.11.11.11 yes    up      9/50   IPv4 none

```

步骤 9：两xTR将更新MAP缓存条目

在VM迁移，为了Site-3前VM的IP的RLOC是西方xTR(10.10.10.10)。VM的后移民向东方DC，当西方xTR收到从Site-3的流量，它将传送SMR信息到Site-3路由器更新新的RLOC地址为东方xTR(10.11.11.11)如下所示：

```

Site-3#sh ip lisp map-cache
LISP IPv4 Mapping Cache for EID-table default (IID 0), 2 entries

0.0.0.0/0, uptime: 02:03:23, expires: never, via static send map-request
Negative cache entry, action: send-map-request
172.16.54.200/32, uptime: 02:00:22, expires: 23:57:56, via map-reply, complete
Locator      Uptime      State      Pri/Wgt
10.11.11.11  00:02:03   up         9/50

```

```

N7K-FA8-East_xTR(config)# show ip lisp map-cache
LISP IP Mapping Cache for VRF "default" (iid 0), 1 entries

```

* = Locator data counters are cumulative across all EID-prefixes

```
172.16.20.0/24, uptime: 00:25:24, expires: 23:34:35, via map-reply, auth
Locator      Uptime      State      Priority/  Data      Control      MTU
              Uptime      State      Weight    in/out    in/out
10.20.20.20  00:25:24   up         10/50     0/0*     0/0         1500
```

故障排除

下面调试可以使用排除故障在受控环境的口齿。

- **debug ip**
-
- **smr**
- **ha**
- **LOC**
- **LOC**
- **debug ip mroute *map_notify_addr/32***
- **debug ip**