

LISP Hands On

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Agenda

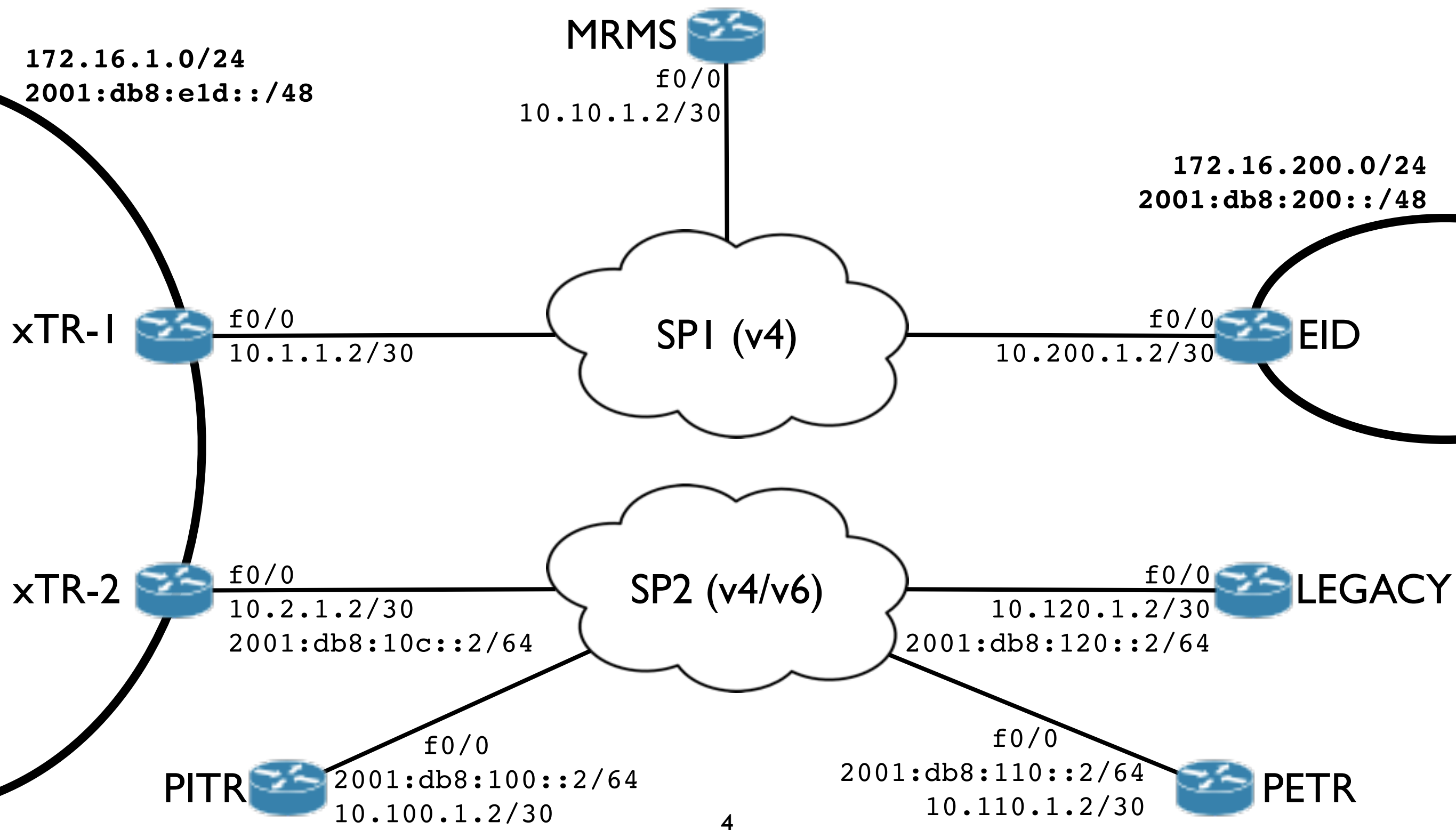
- Playing with IOS
 - OpenLISP
- Deployed public network: LISP4.net

Play with LISP?

- Cisco IOS 15.1XB
 - 1801, 1802, 1803, 1805, 1811, 1812, 1841, 1861, 1941, 1941W, 2801, 2811, 2821, 2851, 2901, 2911, 2921, 2951, 3825, 3845, 3925, 3945, 7201, 7204VXR, 7206VXR
- Cisco IOS XE 2.5.1XA
 - ASR1002, ASR1002-F, ASR1004, ASR1006
- Cisco NX-OS 5.0(3.lisp)
 - Nexus 7000 Series
- OpenLISP 0.2.0 (open source)
 - FreeBSD 7.3, 7.4, 8.1, 8.2
- LISPmob (open source)
 - Linux 2.6.32
- <https://github.com/aless/linux-2.6-lisp> (?)

EIDs
RLOCs

Lab Topology



Single-homed xTR

```
hostname xTR-1
!
ip route 0.0.0.0 0.0.0.0 10.1.1.1
!
router lisp
!
ipv4 itr
ipv4 etr
!
! database
database-mapping 172.16.1.0/24 10.1.1.2 priority 1 weight 100
!
! retrieve the mappings via MRMS
ipv4 itr map-resolver 10.10.1.2
!
! register the database to MRMS
ipv4 etr map-server 10.10.1.2 key 0 PASSWORD_MS
```

Multi-connected xTR

```
hostname xTR-2
!
interface FastEthernet0/0
  description xTR-2 with SP2
  ip address 10.2.1.2 255.255.255.252
  ipv6 address 2001:db8:10c::2/64
!
router lisp
  !
  ipv4 itr
  ipv4 etr
  !
  ! database
  database-mapping 172.16.1.0/24 10.2.1.2 priority 1 weight 100
  database-mapping 172.16.1.0/24 2001:db8:10c::2 priority 99 weight 100
  !
  ! retrieve the mappings via MRMS
  ipv4 itr map-resolver 10.10.1.2
  !
  ! register the database to MRMS
  ipv4 etr map-server 10.10.1.2 key 0 PASSWORD_MS
```

MR / MS

```
hostname MRMS
!
router lisp
!
! ===== Map-Resolver Part =====
ipv4 map-resolver
!
! ===== Map-Server Part =====
ipv4 alt-vrf lisp
!
site LEFT-Site
  authentication-key PASSWORD_MS
  eid-prefix 172.16.1.0/24
  exit
!
vrf definition lisp
!
  address-family ipv4
  exit-address-family
!
  address-family ipv6
  exit-address-family
```

Is it registered?

MRMS#show lisp site

LISP Site Registration Information

Site Name	Last Register	Up	Who Last Registered	Inst ID	EID Prefix
LEFT-Site	00:00:13	yes	10.2.1.2		172.16.1.0/24

MRMS#show lisp site name LEFT-Site

Site name: LEFT-Site

Allowed configured locators: any

Allowed EID-prefixes:

EID-prefix: 172.16.1.0/24 * site inconsistent *****

First registered: 00:02:10

Routing table tag: 0

Origin: Configuration

Merge active: No

Proxy reply: No

TTL: 1d00h

Registration errors:

Authentication failures: 0

Allowed locators mismatch: 0

ETR 10.2.1.2, last registered 00:00:10, no proxy-reply, no map-notify
TTL 1d00h, no merge

Locator	Local	State	Pri/Wgt
10.2.1.2	yes	up	2/100
2001:DB8:10C::2	yes	up	100/100

ETR 10.1.1.2, last registered 00:00:12, no proxy-reply, no map-notify
TTL 1d00h, no merge

Locator	Local	State	Pri/Wgt
10.1.1.2	yes	up	8 1/100

What do xTRs see?

xTR-1#show ip lisp database

LISP ETR IPv4 Mapping Database for EID-table default (IID 0), LSBs: 0x1, 1 entries

172.16.1.0/24

Locator	Pri/Wgt	Source	State
10.1.1.2	1/100	cfg-addr	site-self, reachable

xTR-2#show ip lisp database

LISP ETR IPv4 Mapping Database for EID-table default (IID 0), LSBs: 0x3, 1 entries

172.16.1.0/24

Locator	Pri/Wgt	Source	State
10.2.1.2	2/100	cfg-addr	site-self, reachable
2001:DB8:10C::2	100/100	cfg-addr	site-self, reachable

Multi-homed xTRs

```
hostname xTR-2
```

```
!
```

```
router lisp
```

```
database-mapping 172.16.1.0/24 10.1.1.2 priority 1 weight 100
```

```
database-mapping 172.16.1.0/24 10.2.1.2 priority 10 weight 100
```

```
database-mapping 172.16.1.0/24 2001:db8:10c::2 priority 99 weight 100
```

```
xTR-2#show ip lisp database
```

```
LISP ETR IPv4 Mapping Database for EID-table default (IID 0), LSBs: 0x7, 1 entries
```

```
172.16.1.0/24
```

```
*** MISMATCH IN RLOC CONFIGURATION WITH OTHER SITE xTRs ***
```

Locator	Pri/Wgt	Source	State
10.1.1.2	1/100	cfg-addr	site-other, report-reachable
10.2.1.2	10/100	cfg-addr	site-self, reachable
2001:DB8:10C::2	99/100	cfg-addr	site-self, reachable

```
xTR-1#show ip lisp database
```

```
LISP ETR IPv4 Mapping Database for EID-table default (IID 0), LSBs: 0x1, 1 entries
```

```
172.16.1.0/24
```

Locator	Pri/Wgt	Source	State
10.1.1.2	1/100	cfg-addr	site-self, reachable

Multi-homed xTRs

```
hostname xTR-1
!  
router lisp  
  database-mapping 172.16.1.0/24 10.1.1.2 priority 1 weight 100  
  database-mapping 172.16.1.0/24 10.2.1.2 priority 10 weight 100  
  database-mapping 172.16.1.0/24 2001:db8:10c::2 priority 99 weight 100
```

xTR-1#show ip lisp database

LISP ETR IPv4 Mapping Database for EID-table default (IID 0), LSBs: **0x3**, 1 entries

```
172.16.1.0/24  
  Locator          Pri/Wgt  Source      State  
  10.1.1.2          1/100    cfg-addr    site-self, reachable  
  10.2.1.2          10/100   cfg-addr    site-other, report-reachable  
  2001:DB8:10C::2   99/100   cfg-addr    no-route
```

xTR-2#show ip lisp database

LISP ETR IPv4 Mapping Database for EID-table default (IID 0), LSBs: **0x7**, 1 entries

```
172.16.1.0/24  
  Locator          Pri/Wgt  Source      State  
  10.1.1.2          1/100   cfg-addr    site-other, report-reachable  
  10.2.1.2          10/100   cfg-addr    site-self, reachable  
  2001:DB8:10C::2   99/100   cfg-addr    site-self, reachable
```

Populating the cache

xTR-1#show ip lisp map-cache

LISP IPv4 Mapping Cache for EID-table default (IID 0), 1 entries

0.0.0.0/0, uptime: 00:17:48, expires: never, via static send map-request
Negative cache entry, action: send-map-request

EID#show ip lisp map-cache

LISP IPv4 Mapping Cache for EID-table default (IID 0), 1 entries

0.0.0.0/0, uptime: 00:39:11, expires: never, via static send map-request
Negative cache entry, action: send-map-request

xTR-1#ping 172.16.200.1 source 172.16.1.1 repeat 1

Type escape sequence to abort.

Sending 1, 100-byte ICMP Echos to 172.16.200.1, timeout is 2 seconds:

Packet sent with a source address of 172.16.1.1

.

Success rate is 0 percent (0/1)

xTR-1#show ip lisp map-cache

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

0.0.0.0/0, uptime: 00:20:19, expires: never, via static send map-request
Negative cache entry, action: send-map-request

172.16.200.0/24, uptime: 00:00:08, expires: 23:59:44, via map-reply, complete

Locator	Uptime	State	Pri/Wgt
10.200.1.2	00:00:08	up	1/100

EID#show ip lisp map-cache

LISP IPv4 Mapping Cache for EID-table default (IID 0), 1 entries

0.0.0.0/0, uptime: 00:42:07, expires: never, via static send map-request
Negative cache entry, action: send-map-request

Populating the cache

```
xTR-1#ping 172.16.200.1 source 172.16.1.1 repeat 1
```

```
Type escape sequence to abort.
```

```
Sending 1, 100-byte ICMP Echos to 172.16.200.1, timeout is 2 seconds:
```

```
Packet sent with a source address of 172.16.1.1
```

```
.  
Success rate is 0 percent (0/1)
```

```
EID#show ip lisp map-cache
```

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

```
0.0.0.0/0, uptime: 00:42:56, expires: never, via static send map-request
```

```
  Negative cache entry, action: send-map-request
```

```
172.16.1.0/24, uptime: 00:00:24, expires: 23:59:28, via map-reply, complete
```

Locator	Uptime	State	Pri/Wgt
10.1.1.2	00:00:24	up	1/100
10.2.1.2	00:00:24	up	10/100
2001:DB8:10C::2	00:00:24	no-route	99/100

```
xTR-1#ping 172.16.200.1 source 172.16.1.1 repeat 1
```

```
Type escape sequence to abort.
```

```
Sending 1, 100-byte ICMP Echos to 172.16.200.1, timeout is 2 seconds:
```

```
Packet sent with a source address of 172.16.1.1
```

```
!
```

```
Success rate is 100 percent (1/1), round-trip min/avg/max = 12/12/12 ms
```

```
debug lisp forwarding data-signal-map-request
```

Statistics

xTR-1#show ip lisp statistics

LISP Statistics for instance ID 0 - last cleared: never

Control Packets:

Map-Requests in/out: 0/1

Encapsulated Map-Requests in/out: 0/1

RLOC-probe Map-Requests in/out: 0/0

SMR-based Map-Requests in/out: 0/0

Map-Resolver Map-Requests forwarded: 0

Map-Server Map-Requests forwarded: 0

Map-Reply records in/out: 1/0

Authoritative records in/out: 1/0

Non-authoritative records in/out: 0/0

Negative records in/out: 0/0

RLOC-probe records in/out: 0/0

Map-Server Proxy-Reply records out: 0

Map-Register records in/out: 0/5

Authentication failures: 0

Map-Notify records in/out: 0/0

Authentication failures: 0

Errors:

Map-Request format errors: 0

Map-Reply format errors: 0

Mapping record TTL alerts: 0

Cache Related:

Cache entries created/deleted: 3/1

Number of EID-prefixes in map-cache: 2

Number of negative entries in map-cache: 1

Total number of RLOCs in map-cache: 1

Average RLOCs per EID-prefix: 1

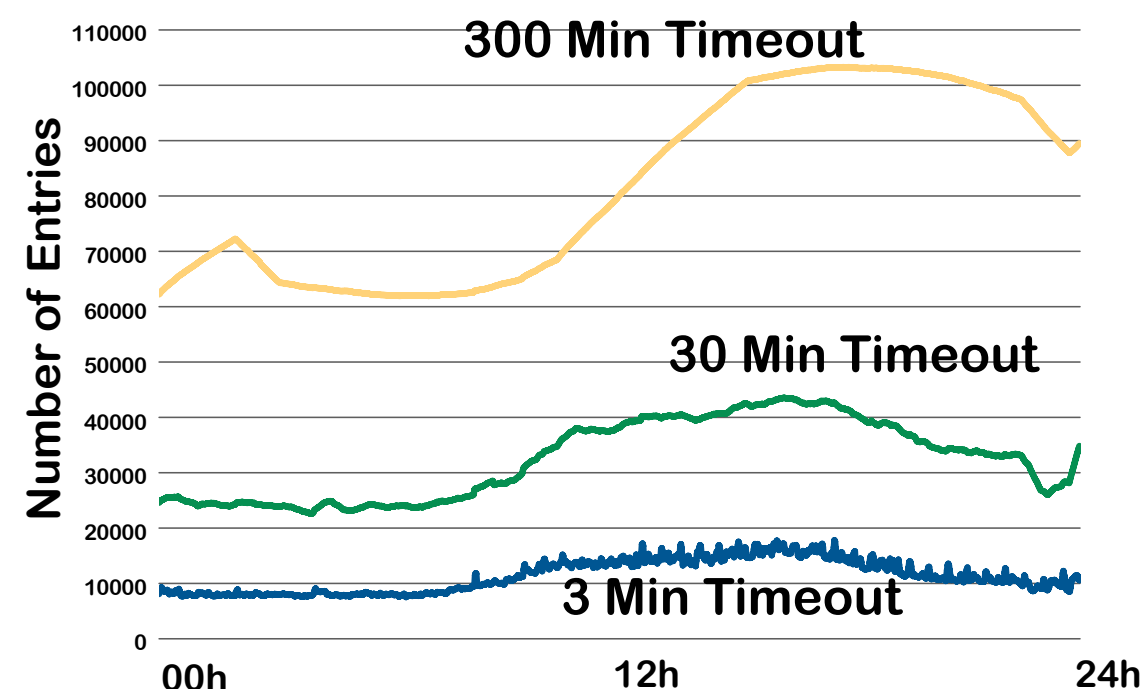
Forwarding:

Number of data signals processed: 1 (+ dropped 0)

Number of reachability reports: 0 (+ dropped 0)

ITR Map-Resolvers:

Map-Resolver	LastReply	Metric	ReqsSent	Positive	Negative	No-Reply
10.10.1.2	00:00:27	15	1	1	0	0



LISP Internet Groper

xTR-1#lig self

Mapping information for EID 172.16.1.0 from 10.2.1.2 with RTT 24 msecs
172.16.1.0/24, uptime: 00:00:56, expires: 23:59:52, via map-reply, self

Locator	Uptime	State	Pri/Wgt
10.1.1.2	00:00:56	up, self	1/100
10.2.1.2	00:00:56	up	10/100
2001:DB8:10C::2	00:00:56	no-route	99/100

xTR-1#lig 172.16.200.1 source 172.16.1.1 to 10.10.1.2

Mapping information for EID 172.16.200.1 from 10.200.1.2 with RTT 16 msecs
172.16.200.0/24, uptime: 00:08:16, expires: 23:59:52, via map-reply, complete

Locator	Uptime	State	Pri/Wgt
10.200.1.2	00:08:16	up	1/100

xTR-1#lig 192.0.2.1 source 172.16.1.1 to 10.10.1.2

Mapping information for EID 192.0.2.1 from 10.10.1.2 with RTT 12 msecs
192.0.0.0/2, uptime: 00:00:00, expires: 00:14:52, via map-reply, forward-native
Negative cache entry, action: forward-native

OpenLISP

- FreeBSD kernel patch at www.openlisp.org
(options LISP)
- gateway_enable="YES"
 ipv6_gateway_enable="YES"
 mapd_enable="YES"
- map add -cache
 -inet 172.16.1.0/24
 -inet 10.1.1.2 1 100 1
 -inet 10.2.1.2 2 100 1
 -inet6 2001:db8:10c::2 99 100 1

Statistics

```
# mapstat -X
```

```
Mapping tables:
```

```
Internet:
```

EID	Flags	RLOC(s)	P	W	F
1.1.0.0/16	SU	ARennes-651-1-1	1	100	U
		n003-000-000-00	2	100	U
		4.4.4.4	3	100	
		5.5.5.5	255	100	

```
# mapstat -s -p lisp
```

```
lisp over ip:
```

```
0 Datagrams received
  (0 of which had IPv6 outer header)
  0 with incomplete header
  0 with bad encap header
  0 with bad data length field
  0 with bad source version number field
  0 with bad destination version number field
  0 delivered
0 datagrams output
  (0 of which with IPv6 inner packet)
  0 dropped due to cache-miss
  0 dropped due to no suitable RLOC
  0 dropped due to MTU
  0 dropped due to no buffer space
  0 dropped on output
  0 sent
```

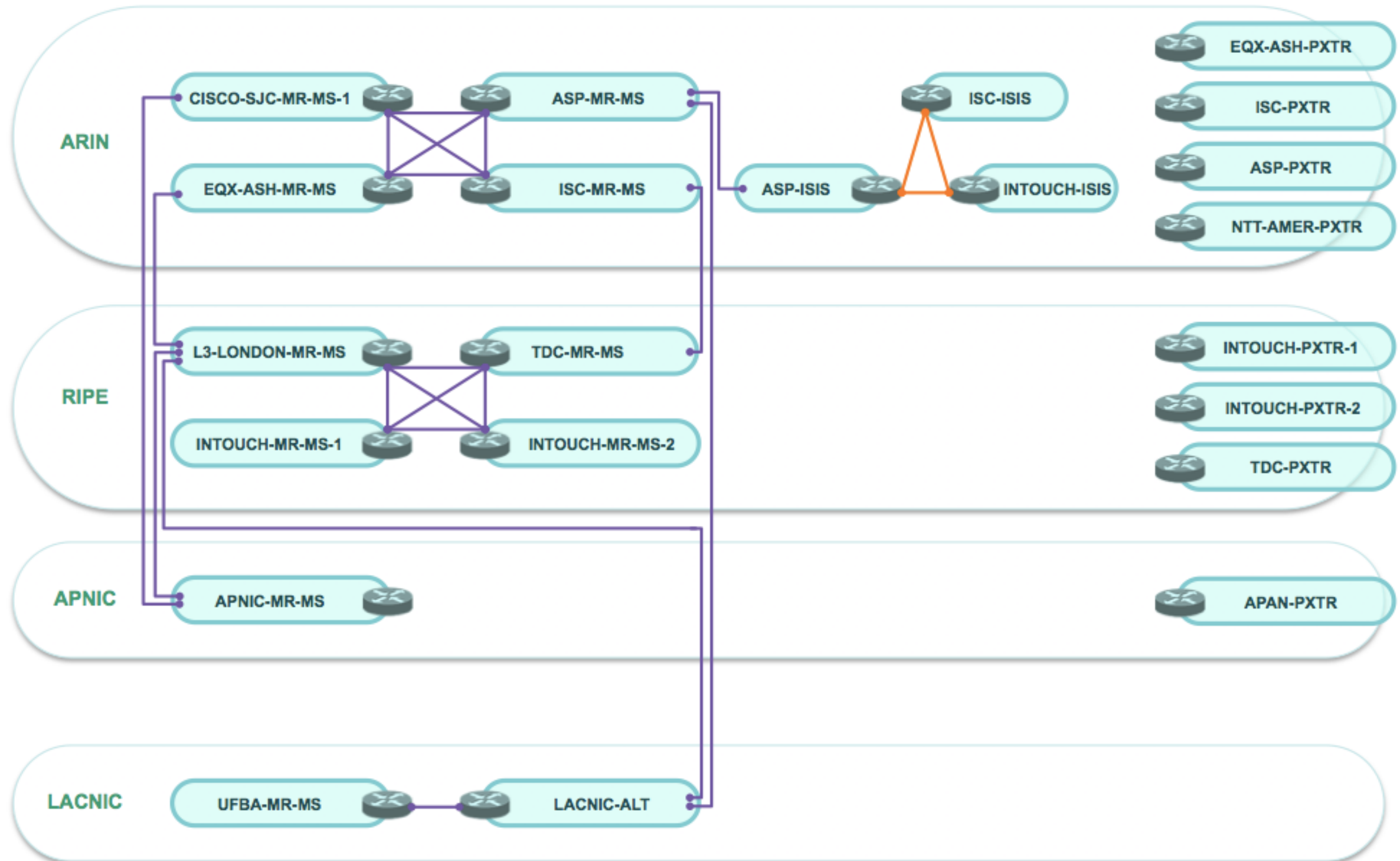
```
lisp over ip6:
```

```
0 Datagrams received
  (0 had IPv4 outer header)
  0 with incomplete header
  0 with bad encap header
  0 with bad data length field
  0 with bad source version number field
  0 with bad destination version number field
  0 delivered
0 datagrams output
  (0 of which with IPv4 inner packet)
  0 dropped due to cache-miss
  0 dropped due to no suitable RLOC
  0 dropped due to MTU
  0 dropped due to no buffer space
  0 dropped on output
  0 sent
```

Deployed public network: LISP4.net

- Open network for the community
- 129 xTRs, 9 PxTR, 11 MR/MS, rely on ALT
- EID prefix: 153.16.0.0/16, 2610:00D0::/32
- Monitoring tools (google maps, smoke ping, looking glasses, reverse DNS, archives)
- How to participate? www.lisp4.net

International LISP Beta Network High Level Topology – Connecting LISP Service Providers Together



More?

- Dynamips on my laptop
 - Lab configured and ready to play
 - 9 Cisco 7206VXR with IOS 5.1(4)XB5 (fcl)
 - just ask to get a console @beer event ;-)