LISP Deployment at Facebook

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## Agenda

1. Background
2. LISP for v4
3. LISP for v6
Background
Locator/ID Separation Protocol (LISP)

- Scalable routing and addressing
- IETF working group
- draft-ietf-lisp-*.txt
- Decoupling of client’s identifier and location
- IP encapsulation
  - Eg. v4 in v4, v6 in v4, v6 in v6
- Map and encap
Locator/ID Separation Protocol (LISP)

- No changes to end systems
- Incrementally deployable
- Multi-homing controls for stub AS
- Facebook was the first major website on LISP (v4 and v6)
LISP forwarding

- **1.0.0.0/8 EID**
- **2.0.0.0/8 EID**

**ITR:** Ingress Tunnel Router

**ETR:** Egress Tunnel Router

**XTR:** Ingress/Egress Tunnel Router

- **10.0.0.0/8 Provider A**
- **12.0.0.0/8 Provider X**
- **13.0.0.0/8 Provider Y**

**S:** Source

**D:** Destination

- 1.0.0.1 → 10.0.0.1
- 11.0.0.1
- 1.0.0.1 → 11.0.0.1
- 11.0.0.1 → 12.0.0.2
- 1.0.0.1 → 12.0.0.2

**Inner header:**

**Outer header:**

**Provider B 11.0.0.0/8**

**Provider X 12.0.0.0/8**

**Provider Y 13.0.0.0/8**

**1.0.0.1 → 2.0.0.2**

**11.0.0.1 → 12.0.0.2**

**11.0.0.1 → 12.0.0.2**

**1.0.0.1 → 2.0.0.2**

**1.0.0.1 → 2.0.0.2**

**1.0.0.1 → 2.0.0.2**
Glossary

- **EID** = Endpoint Identifier
  - Portable ID
  - Inner header address
  - What you want to connect to (service, user)

- **Locator** = Routing Locator = RLOC
  - Globally routable address
  - Outer header address
  - How you reach an EID
My simplistic analogy

- DNS resolver provides IP address when you want to reach www.facebook.com

- LISP resolver provides **locator** when an ITR wants to reach (encap for) an EID
Why

- Curious
  - How would it work at a large content provider?
- Deployment experience
- Provide real-world feedback, Influence spec
- Work with Dino again
- Easy
LISP goals

- Serve Facebook over LISP
- Model real-world, full-scale deployment
- Reach v6 users using LISP
LISP for v4
XTR placement options

Datacenter

Cluster

Metro

POP

POP
Typical beta setup

- XTR adjacent with EIDs/hosts

EID space 153.16.x/24

Lab or home network

Rest of network

Internet

Locator address
XTR placement

- But for us, EID = VIP
  - Beta user approach won’t scale with large number of VIPs, clusters
- Choose to deploy at cluster agg (datacenter) layer
- Could also be viable at POP
IBGP 153.16.15/24, 153.16/16

To backbone, edge routers

AS32934

153.16/16, ip 500

IBGP 153.16/16, ip 10000

153.16/16, 153.16.15/24 > DR

AS64550 LISP "jail"

static: 153.16/16, 153.16.0.0/16 > null

ext: v600, 153.16.15/24

VIF: www.lisp.f.acebook.com 153.16.15.71/24

XTR: eTR + iTR
DR: Datacenter router
CSW: Cluster switch
LB: Load Balancer

Jail ACLs in/out

PUBLIC > Jail:
- Allow ssh in from whitelist
- Allow dpport 4341:4342 in
- Allow dpport 4342 map-replies in
- Allow icmp in/out
- Allow dpport 4341 out
- Allow dpport 4341 out
- Allow sport 4342 map-replies out
- Allow 80 443 out

AS65155: Cluster01

AS65156: Cluster02
LISP for v4 results

- Easy deployment, config
- Most effort: ACL authoring
  - To strictly filter LISP protocols, encap
- www.lisp4.facebook.com
Project Cakewalk
LISP for v6
Production v4

Public v4

FB BB (mostly) v4

v4 LB v4 LB v4

Production v4 VIPs
XTR

Public v6

PITR  PETR

Public v4

FB BB (mostly) v4

v6 required here only

LB

v6

Production v4 VIPs

v4  v4  v4

v4  v4  v4
Deployment

- XTR
- LB
- Cluster Switch
- Metro/Backbone
- Datacenter layer
- Racks
Deployment

VIP/EID = 2610:d0:face::9
Config

XTR

ipv6 lisp use-petr 149.20.48.60
ipv6 lisp database-mapping 2610:D0:FACE::/48 74.119.77.125 priority 1 weight 50
ipv6 lisp itr map-resolver 128.223.156.35
ipv6 lisp etr map-server 206.223.132.89 key f00bar

LB

virtual www.lisp6.facebook.com_vs {
  snat automap
  pool www.http.vips.pool
  destination 2610:d0:face::9.http
  ip protocol tcp
  profiles {
    http {}
    tcp-wan-optimized {}
  }
}

DNS

www.lisp6       IN   AAAA   2610:d0:face::9
Config

XTR

ipv6 lisp use-petr 149.20.48.60
ipv6 lisp database-mapping 2610:D0:FACE::/48 74.119.77.125 priority 1 weight 50
ipv6 lisp itr map-resolver 128.223.156.35
ipv6 lisp etr map-server 206.223.132.89 key f00bar

LB

virtual www.lisp6.facebook.com_vs {
  snat automap
  pool www.http.vips.pool
  destination 2610:d0:face::9.http
  ip protocol tcp
  profiles {
    http {}
    tcp-wan-optimized {}
  }
}

DNS

www.lisp6 IN AAAA 2610:d0:face::9
Cakewalk results

- Same FB codebase as v4
- Deployed in 4 hours
- Added one router (LISP XTR)
- Required three v6 addresses
- $0 cost
- LISP is transparent to all v6 users
www.lisp6.facebook.com
m.lisp6.facebook.com

Experimental, non-production

Make your next status update over IPv6