A Decentralized Mapping System
draft-farinacci-lisp-decent-00

IETF London
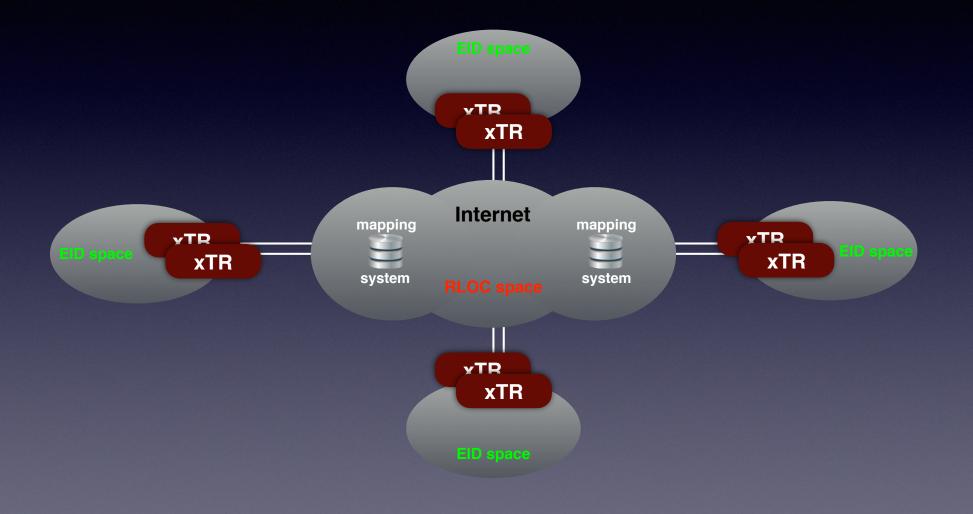March 2018

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Problem Statement

- What if LISP xTRs didn't need to depend on a third-party

- What if LISP xTRs could multi-home and roam to inform each other about new RLOCs

- What if LISP xTRs could be their own mapping system

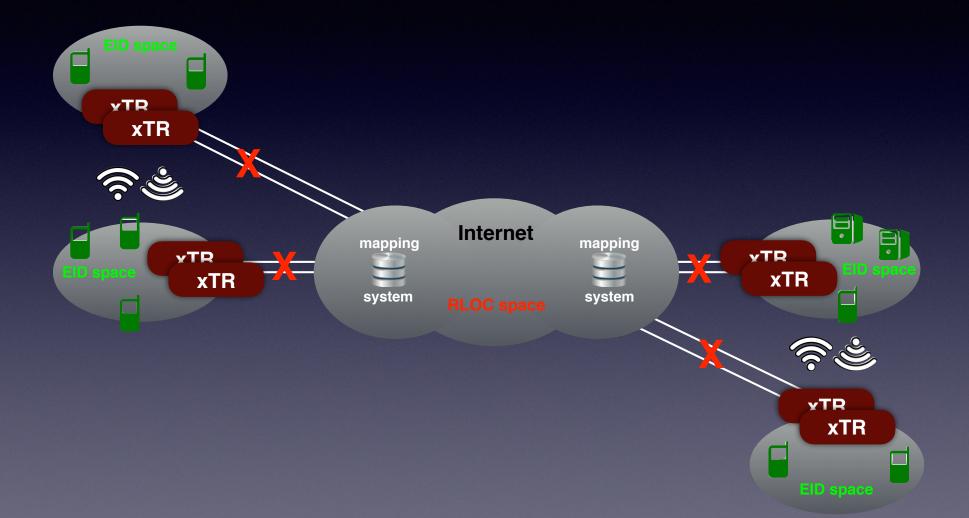- Let's build a purely democratized and decentralized control-plane

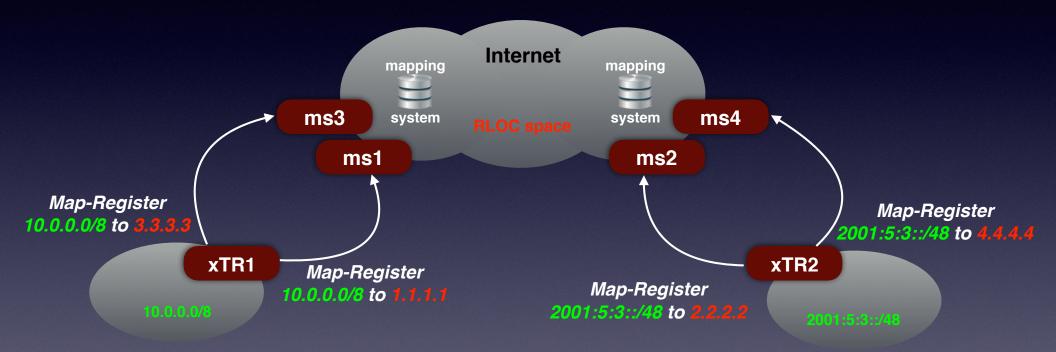*Endpoint IDs (EIDs)*   *Routing Locators (RLOCs)*

Today's Model Mapping System

EID space

xTR
xTR

EID space

xTR
xTR

Internet

mapping

system

RLOC space

mapping

system

xTR
xTR

EID space

xTR
xTR

EID space

Network Connectivity

EID space

xTR
xTR

EID space

xTR
xTR

Internet

mapping system

mapping system

RLOC space

xTR
xTR

EID space

xTR
xTR

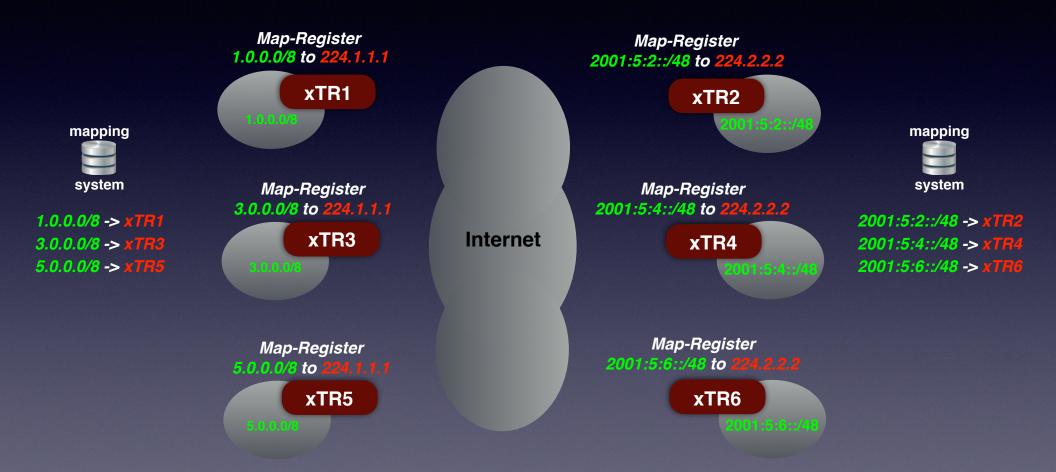EID space

LISP Control-Plane Messages

Decentralized Map-Server?

- What if each xTR was a Map-Server

- What if each xTR could Map-Register to each xTR

- The mapping system would be synchronized

- An xTR could be a Map-Resolver for itself

How to Define a Mapping System

- A consolidated mapping system is identified by a multicast group address

- The xTRs that are part of a mapping system join the same multicast group

- Map-Registers are sent to the group - all xTRs receive all mappings

- Efficient distribution when underlay supports multicast or head-end replication at each xTR

LISP-Decent Control-Plane Messages

Map-Register
1.0.0.0/8 to 224.1.1.1

xTR1

1.0.0.0/8

Map-Register
2001:5:2::/48 to 224.2.2.2

xTR2

2001:5:2::/48

mapping
system

Map-Register
3.0.0.0/8 to 224.1.1.1

xTR3

3.0.0.0/8

1.0.0.0/8 -> xTR1
3.0.0.0/8 -> xTR3
5.0.0.0/8 -> xTR5

Internet

Map-Register
2001:5:4::/48 to 224.2.2.2

xTR4

2001:5:4::/48

mapping
system

2001:5:2::/48 -> xTR2
2001:5:4::/48 -> xTR4
2001:5:6::/48 -> xTR6

Map-Register
5.0.0.0/8 to 224.1.1.1

xTR5

5.0.0.0/8

Map-Register
2001:5:6::/48 to 224.2.2.2

xTR6

2001:5:6::/48

Benefits

- xTRs only depend on each other - they do so already if they want to talk to each other

- No third-party trust or dependency exists

- Map-Request lookup has low latency

- xTRs build and send *1* Map-Register for *n* xTRs

- Management simplified by accessing one xTR to get all mappings

- Pretty much same benefits as peer-to-peer networking

Use-Cases

- Crypto-Currency Applications

- Emergency Networking (Mesh Networks)

- Plug-and-Play VPN Networking

- Space Networking (Software-Defined Satellites)

- Sharable Economy Apps

Brief LISP-Decent Demo

- 3 containers each running a *lispers.net* xTR

- Docker bridge NOT doing multicast

- xTRs are doing head-end replication

- xTRs register an IPv4 EID-prefix and a Name EID

LISP-Decent in Action

lispers.net

Scalable Open Overlay Networking

Enter EID for Site-Cache lookup: [ ] Submit

LISP-MS Site Information:

Site Name	EID-Prefix or (S,G)	Registered	Last Registerer	Last Registered	First Registered	Registration Flags
EIDs	[1]	(ams)	--	never	never	--
	[1]3.3.3.3/32	**yes** (dynamic)	[0]172.17.0.7	0:00:29	0:03:34	p-s-l-t-r-m-n
	[1]'nexus-n3'	**yes** (dynamic)	[0]172.17.0.7	0:00:29	0:03:34	p-s-l-t-r-m-n
	[1]1.1.1.1/32	**yes** (dynamic)	[0]172.17.0.5	0:00:33	0:01:33	p-s-l-t-r-m-n
	[1]'nexus-n1'	**yes** (dynamic)	[0]172.17.0.5	0:00:33	0:01:33	p-s-l-t-r-m-n
	[1]2.2.2.2/32	**yes** (dynamic)	[0]172.17.0.6	0:00:30	0:01:30	p-s-l-t-r-m-n
	[1]'nexus-n2'	**yes** (dynamic)	[0]172.17.0.6	0:00:30	0:01:30	p-s-l-t-r-m-n
peer-groups	[1](0.0.0.0/0, 224.0.0.0/4)	(ams)	--	never	never	--
	[1](0.0.0.0/0, 224.1.1.1/32)	**yes** (dynamic)	[0]172.17.0.7	0:00:05	0:03:18	P-s-l-t-R-m-n

LISP-Decent in Action

lispers.net

Scalable Open Overlay Networking

n1

Site name: peer-groups, EID-prefix: [1](0.0.0.0/0, 224.1.1.1/32), registered: **yes**, dynamic
  Description:
  Last registerer: [0]172.17.0.6, xTR-ID: 0xab64c2b4849e579d, site-ID: 0
  First registered: 0:10:39, last registered: 0:00:01, auth-type: sha1, registration flags: P-s-I-t-R-m-n
  Default registration timeout TTL: 180 seconds
  Forcing proxy Map-Reply: yes
  Forcing proxy Map-Reply for xTRs behind NATs: no
  Send drop-action proxy Map-Reply to PITR: no
  Proxy Map-Reply action: not configured
  Allowed RLOC-set: any

  Registered RLOC-set (merge-semantics):
    [0]no-address, state: up-state, up/uw/mp/mw: 255/0/1/100
        rle: 172.17.0.5(L128), 172.17.0.6(L128), 172.17.0.7(L128)

LISP-ITR Map-Cache: (clear cache)

Enter EID for Map-Cache lookup: [   ] (Submit)

EID-Prefix or (S,G)	Uptime TTL	RLOC Record RLOC Keys	Map-Reply Source	RLOC Send Stats	RLOC State RLOC Action	Unicast Priority/Weight Multicast Priority/Weight
[1](0.0.0.0/0, 224.1.1.1/32)	0:05:05 24 hours	rle: 172.17.0.5(L128), 172.17.0.7(L128), 172.17.0.6(L128)	map-notify	packet-count: **35** byte-count: **5315**	up-state since 0:05:05 encapsulate	255/0 1/100

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Questions/Reactions/Tomatoes?