

An open source mapping library for the Locator/ID Separation Protocol (LISP)

Research Project 2

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Presentation outline

Topics discussed today

- Research questions
- InTouch NV
- Challenges with current Internet routing
- LISP topologies
- LISP control plane
- Library and diagnostic tooling
- Results and conclusion

Please keep your questions until the end of the presentation.

My RP2 assignment

Main research question

How can the Linux operating system resolve LISP map requests and how can it reply to them?

Sub questions

- 1 What is LISP and what benefits can it offer?
- 2 How does the LISP control plane operate?
- 3 Which functionality should be included in the basic library?
- 4 What kind of basic tools can be created using the library?

My RP2 company



InTouch NV

- Business to business provider of cloud services
- Two autonomous systems, 15 POPs in EU, own MPLS cloud
- Active participant in the development of LISP within IETF
- Deploying LISP on production network after the summer

My supervisors; Job Snijders and Rager Ossel

Challenges with current Internet topologies

How to deal with the following...?

- **A sender specifies to who and where a packet goes**
This final destination is hard to modify or reroute
- **Our dependance on PA space instead of PI space**
PI not feasible without AS and IPv6
- **Difficult to geographically spread your network**
Hard to index, reach and manage address spaces
- **Multihoming is not easy**
You need control over BGP config and an AS
- **Can you reach your nearest IXP with IPv6 in EU?**
Core, edge and modems are not ready for end to end IPv6

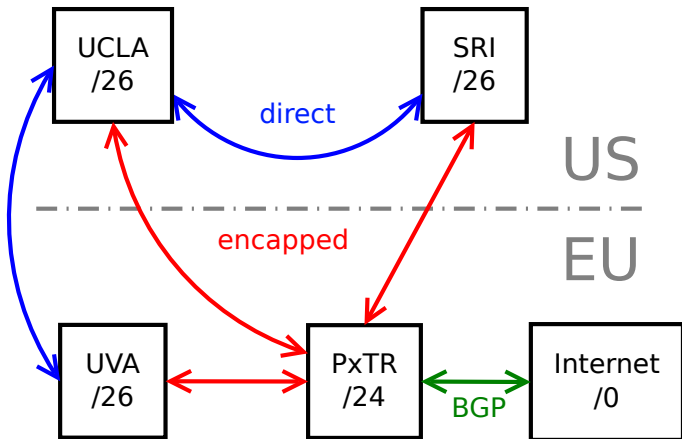
A solution; Locator/ID Separation Protocol



Characteristics of the protocol

- Overlay network, level 3 IP routing
- IETF developed
- Address agnostic
- Network based and/or host based
- Pull instead of push based

Example; global connectivity within same address range



Note; all LISP sites register with a MS and lookup using a MR

LISP characteristics

Protocol benefits

- Don't need expensive layer 2 to sites, LISP is layer 3
- Nodes and networks register in distributed mapping system
- LISP works independent of carrier and address family
- IPv6 transition support
- Mobile LISP (Android, Linux, Qualcomm) (still in testing)

Keep in mind

- Right now, one vendor for stable network based LISP
- You lose layer 2 reliability and control (but gain flexibility)

Project deliverables; the library

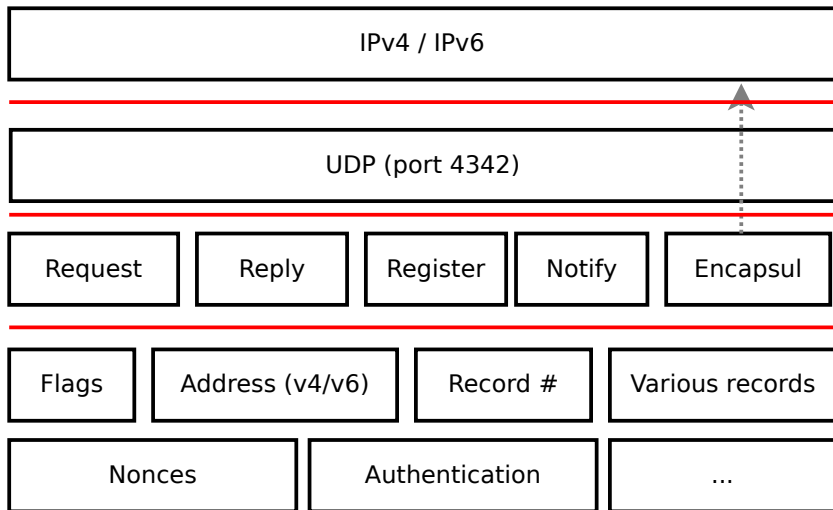
Design considerations

- **Python** - ease of use, portability, extensibility
- **Scapy** - takes care of IP and UDP

Control plane packets that can be spawned

- **MapRequests** - *request an RLOC based on EID address*
- **MapReplies** - *return the RLOC(s) for an EID prefix*
- **MapRegisters** - *register a site within LISP*
- **MapNotifications** - *confirm register request processed*
- **Encapsulated Control Messages** - *XTR traffic*

Abstract overview of packet assembly and dissection



Project deliverables; LISP Internet Groper

Diagnostic tool; 'pyLIG' (based on LISP Internet Groper)

- Original was written in C by David Meyer
- Queries for the routing locators of a LISP site
 - Q: *'Where is LISP EID x.x.x.x?'*
 - A: *'You can find it at IP y.y.y.y.'*
- My tool interprets the received reply in a useful way
- Can easily be extended or modified

More tools in the pipeline, check GitHub soon.

Results and future work

'py-lispnetworking' is now available

- Compatible with draft-ietf-lisp-13.txt (June 2011)
- Synchronous Python library
- Released under GPL2 license

The library enables the following

- Register nodes in LISP (device needs kernel support)
- Testing of LISP control plane (i.e. authentication fields)
- Provides packet handling for the creation of a daemon
- Debugging and hacking of routing hardware

End of presentation

Useful websites

- <https://github.com/intouch/py-lispnetworking>
- LISP public beta network - <http://www.lisp4.net>
- InTouch NV - <http://www.intouch.eu>

More information

- Feel free to mail me about LISP; marek.kuczynski@os3.nl
- This presentation - <http://www.marek.asia/lisp.pdf>

Thanks for watching

Questions can be asked now



Extra slides

Example of a packet dissection with 'py-lispnetworking'

```
###[ LISP_Type ]###
###[ LISP Map-Request packet ]###
ptype= 1L
request_flags=
pl= 0L
itr_rloc_count= 1
request_count= 1
nonce= 0x2214e845d51824a3
request_afi= 0
\itr_rloc_records\
|###[ ITR RLOC Address ]###
|  afi= 1
|  address= '85.184.2.10'
|###[ ITR RLOC Address ]###
|  afi= 2
|  address= '2001:6e0:4:2::2'
\request_records\
|###[ LISP Map-Request Record ]###
|  reserved= 0
|  eid_mask_len= 24
|  request_afi= 1
|  request_address= '153.16.11.0'
```

Routing Locator and Endpoint Identifier split

Addressing contains two components

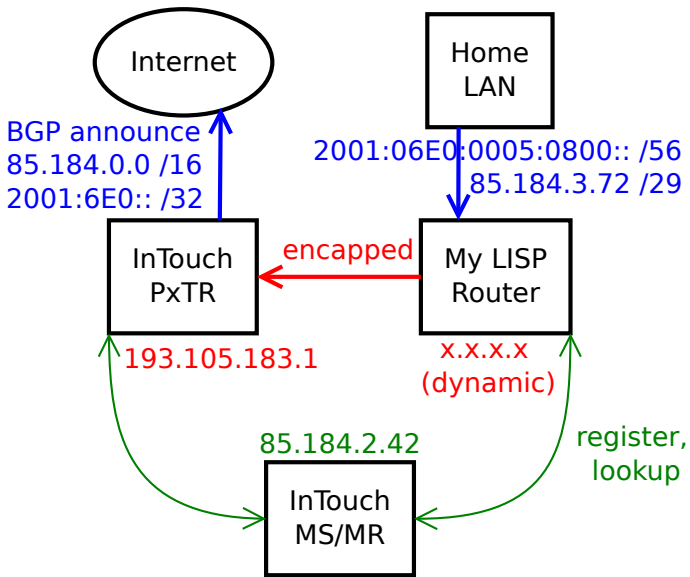
Routing Locators (RLOCs) + Endpoint Identifiers (EIDs)

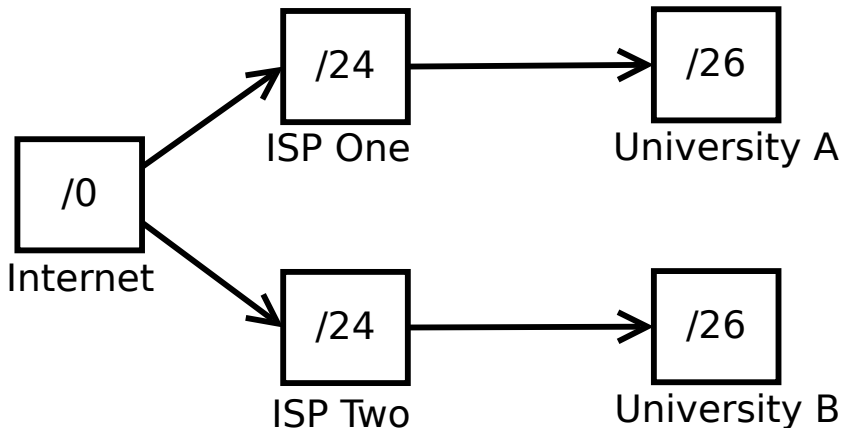
Globally routeable addresses

- IPv4: 85.184.3.(72..80) /29, part of a /16
- IPv6: 2001:6e0:5:800::2 /56, part of a /32

A local area network divided over multiple RLOCs

- IPv4: 85.184.3.75, 10.0.0.(0..255) Layer 3
- MAC addresses: 85.184.3.75, E0:CB:4E:42:(00..FF) Layer 2





ISP routes the traffic for you and assigns you IP space. Not possible to switch ISP easily. A cooperating with B is hard.