LISPmob: enhanced network layer mobility solution

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What if your mobile gadget…

- … could roam across different radios without dropping connections?
  - or even use them simultaneously?
- … could maintain its IP address regardless of location
  - and accept incoming connections?

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Existing (sort of) solutions

- Tunnels and VPNs
  - E.g. free SIXXS IPv6 tunnel
  - Constant IP, but path stretch (RTT and privacy issues)
- Mobile IP
  - Path stretch can only be avoided for IPv6

Locator/ID separation

- Users keep using DNS names (are you still hardcoding IPs??)

- Applications bind to Endpoint IDentifiers (EIDs)

- Routing is done on Routing LOCators (RLOCs)

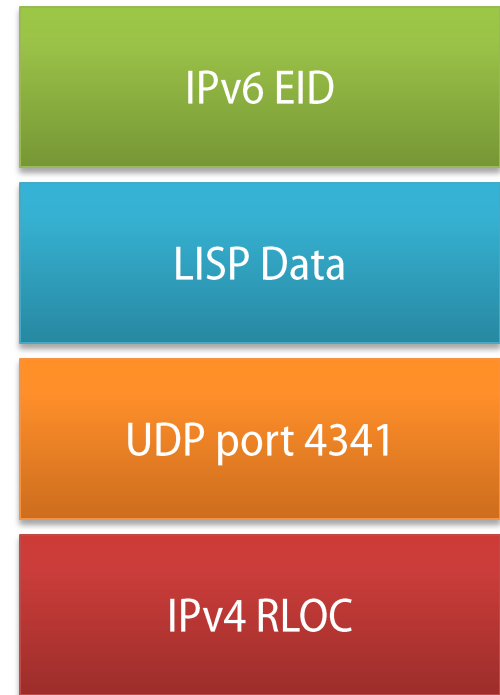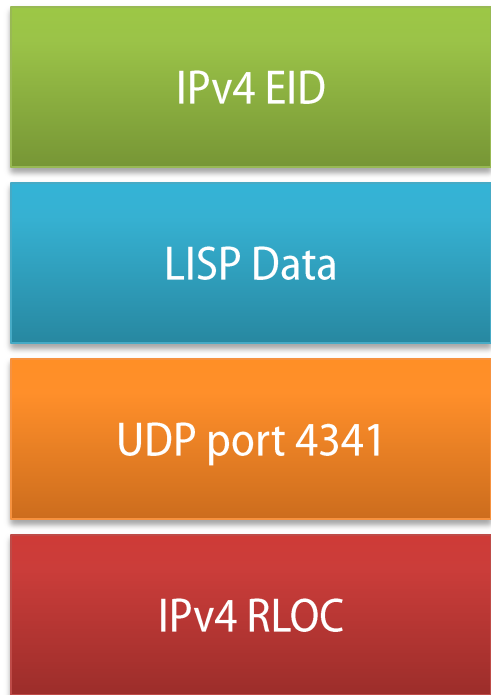| DNS	EID	RLOC
www.lisp4.net ⟷	153.16.10.11 ⟶	173.36.254.162

- It's like creating dynamic tunnels

LISP-MN

- Global IP mobility solution

- Multi-homing, with ingress traffic engineering

- Changing network layer attachment does not affect transport layer connections

- IETF draft specification

Encapsulation

IPv4 EID
LISP Data
UDP port 4341
IPv4 RLOC

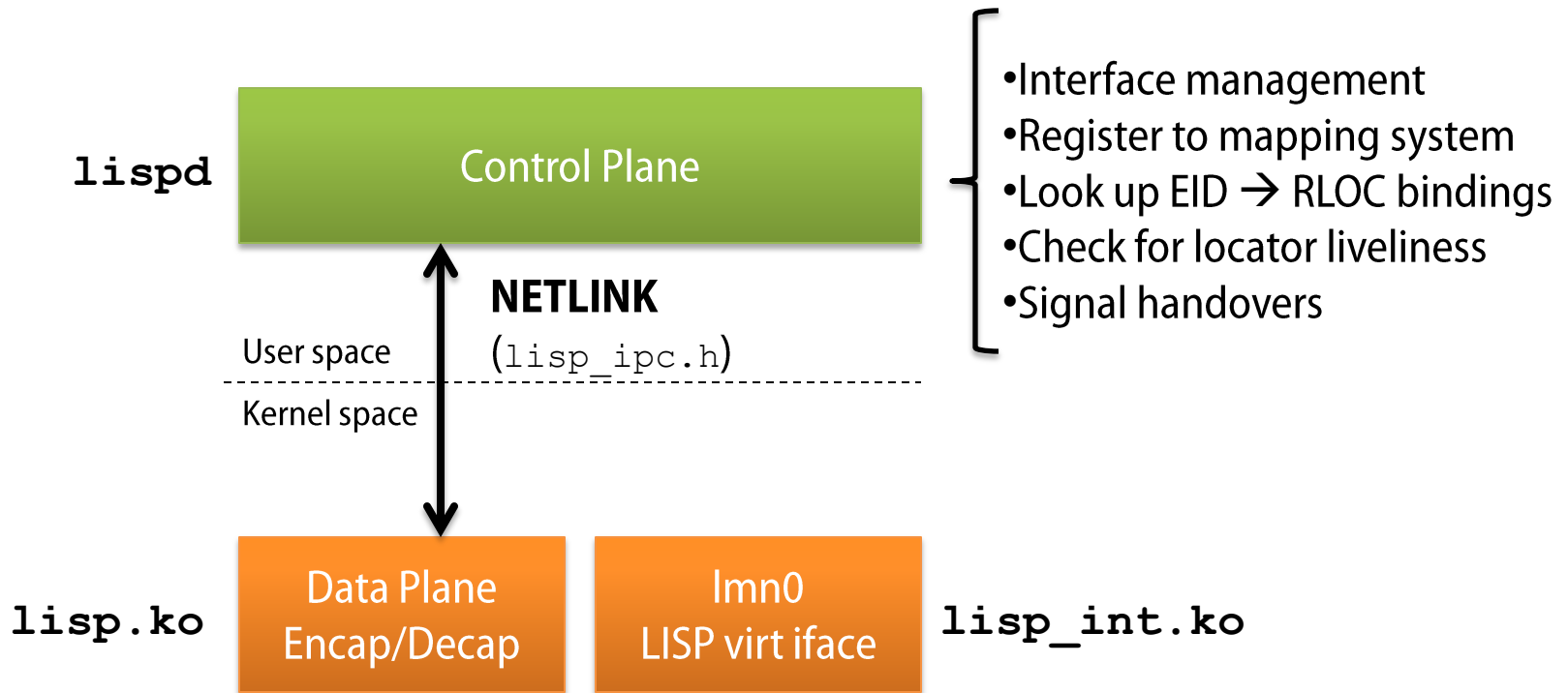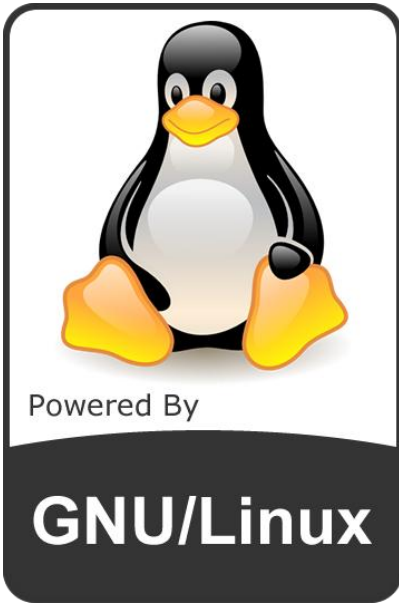| IPv6 EID |
|:---:|
| LISP Data |
| UDP port 4341 |
| IPv4 RLOC |

Does it work behind NAT?

- NAT traversal specification is currently being worked on

- The project is already working on the code to support it

LISPmob project history

- Internal tool at Cisco for IETF protocol specification development

- UPC became open sourcing partner
  - Added features
  - Improved usability

- Building a community of users and developers
  - Source available on Github
  - Project web page at UPC (links on last slide)
  - Can provide EIDs to developers and early users

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Architecture

Control Plane

lispd

- Interface management
- Register to mapping system
- Look up EID → RLOC bindings
- Check for locator liveliness
- Signal handovers

NETLINK
(`lisp_ipc.h`)

User space
Kernel space

Data Plane
Encap/Decap

lisp.ko

Imn0
LISP virt iface

lisp_int.ko

Desktops/Servers

Android Gingerbread

OpenWRT

Meego 1.2 CE / N900

Implementations

- Generic Linux
  - Developed on Ubuntu 10.04 LTS
  - Will soon switch to 12.04 LTS
  - NetworkManager must be disabled
- MeeGo 1.2 CE on the N900
  - Needs custom kernel (to support advanced routing)
  - Connection Manager must be disabled
 - LISPmob code needs no modifications

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Implementations (cont.)

- Android Gingerbread
  - Developed by Chris White
  - Separate control plane, may be open sourced later
- OpenWRT
  - Developed by Vasileios Lakafosis
  - Tested on the Linksys WRT160NL
  - Under review upstream

Other open source code bases

- OpenLISP
  - FreeBSD, similar kernel/user space split architecture
  - Luigi Iannone at Deutsche Telekom Laboratories
- GSoC 2010
  - Generic Linux
  - Alex Lorca (aless)
  - Little activity after GSoC

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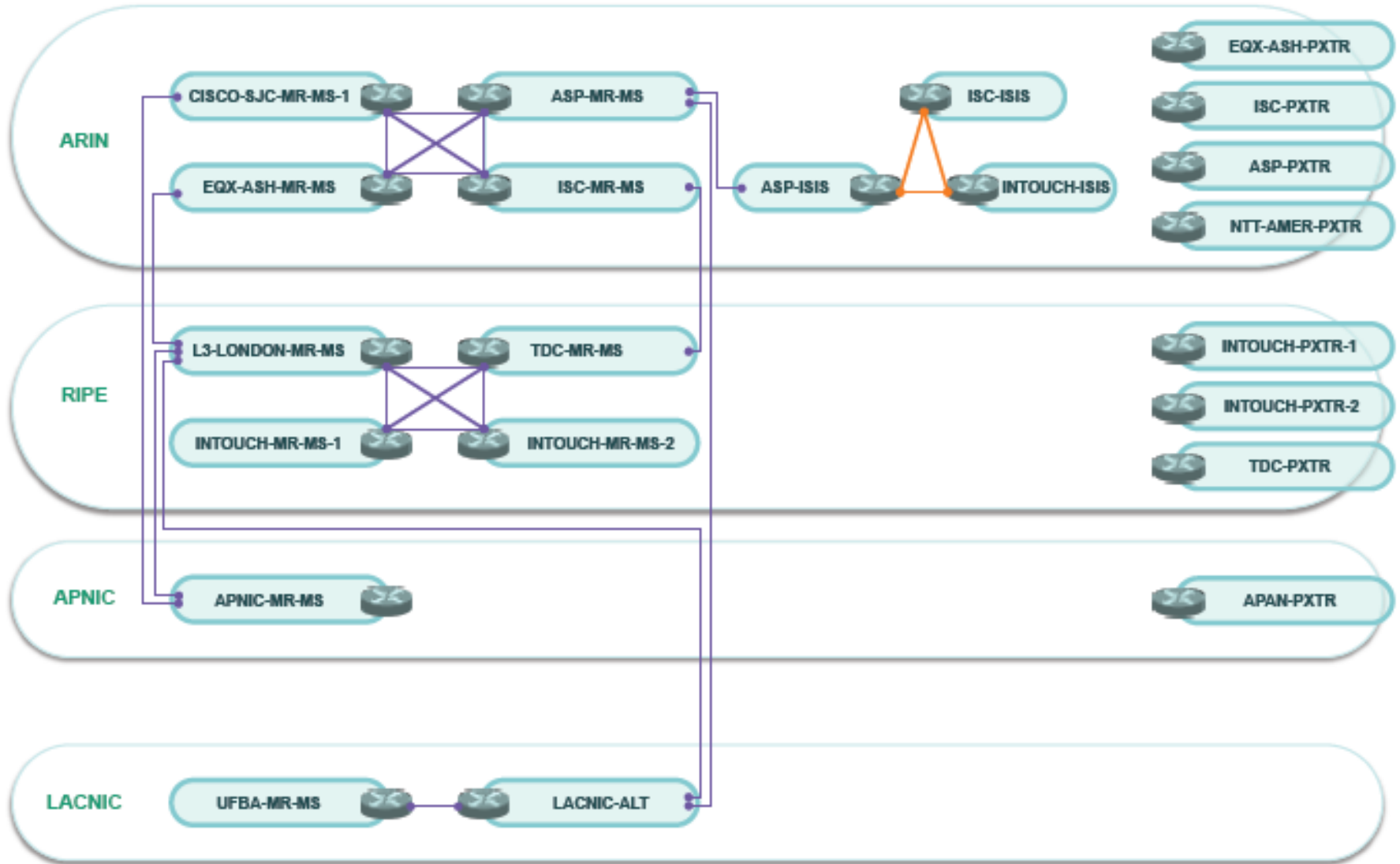
LISPmon

https://lispmob.org/

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File   Edit   View   Go   Capture   Analyze   Statistics   Telephony   Tools   Internals   Help

Filter: [   ] ▾   Expression...   Clear   Apply

No.	Time	Source	Destination	Protocol	Info
1	0.000000	85.184.2.22	84.88.81.2	LISP	Map-Request
2	0.000740	84.88.81.2	85.184.2.22	LISP	Map-Reply
3	9.182046	84.88.81.2	195.50.116.18	LISP	Map-Register

> Frame 2: 106 bytes on wire (848 bits), 106 bytes captured (848 bits)
> Ethernet II, Src: Cisco_ee:f4:70 (00:05:9a:ee:f4:70), Dst: JuniperN_23:70:db (00:12:1e:23:70:db)
> Internet Protocol, Src: 84.88.81.2 (84.88.81.2), Dst: 85.184.2.22 (85.184.2.22)
> User Datagram Protocol, Src Port: lisp-control (4342), Dst Port: lisp-control (4342)
∨ Locator/ID Separation Protocol
    0010 .... = Type: Map-Reply (2)
    .... 1... .... = P bit (Probe): Set
    .... .0.. .... = E bit (Echo-Nonce locator reachability algorithm enabled): Not set
    .... ..00 0000 0000 0000 0000 = Reserved bits: 0x000000
    Record Count: 1
    Nonce: 0xeb838c606bbb5c03
    ∨ EID prefix: 153.16.32.16/28, TTL: 1440, Authoritative, No-Action
        0000 .... = Reserved: 0x0000
        .... 0000 0000 0000 = Mapping Version: 0
        Local RLOC: 84.88.81.2 (probed), Reachable, Priority/Weight: 1/100, Multicast Priority/Weight: 255/0
        Local RLOC: 2001:40b0:7500:15::2, Reachable, Priority/Weight: 2/100, Multicast Priority/Weight: 255/0

```
0020   02 16 10 f6 10 f6 00 48   2a cb 28 00 00 01 eb 83    .......H *.(.....
0030   8c 60 6b bb 5c 03 00 00   05 a0 02 1c 10 00 00 00    .`k.\... ........
0040   00 01 99 10 20 10 01 64   ff 00 00 07 00 01 54 58    .... ..d ......TX
0050   51 02 02 64 ff 00 00 05   00 02 20 01 40 b0 75 00    Q..d.... .. .@.u.
0060   00 15 00 00 00 00 00 00   00 02
```

○ Nonce (lisp.nonce), 8 bytes   Packets: 288 Displayed: 288 Marked: 0 Load time: 0:00.105   Profile: Default

Integration

- Are you a developer for a project that could use LISPmob?

- Let us know your needs, we'll try to cater to them…
  - … so that you can integrate it
  - … or that we can interface with it

https://lispmob.org/

https://github.com/LISPmob/lispmob

https://tools.ietf.org/html/draft-meyer-lisp-mn