LISP for the Mobile Network

draft-farinacci-lisp-mobile-network-03

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High-Level Goals

- Greatly **Simplify** the Mobile Network:
    - To meet new latency and bandwidth demands (*VR/AR*)
    - To address newer and more demanding applications (*IoT*)
- Pull Based Mapping Database System **Control-Plane**:
    - To Scale and Secure Mobility
    - To Reduce OpEx through Incremental Deployability
- Dynamic Encapsulating Overlay Based **Data-Plane**:
    - Address Management greatly simplified
    - Fast Mobility Handoffs
    - Roaming across Mobile Networks and WiFi

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

How it Works

- UEs are assigned EID addresses
- gNBs and UPFs are LISP xTRs with RLOC addresses
- The Underlay is the existing EPC or Next-Gen Core (NGC) IP network
- The Overlay runs over the NGC and the Internet
- LISP Mapping System can run anywhere in NGC
- Encapsulation occurs over NGC *and not the RAN*
- Encapsulation format is GTP or LISP with real-time setup (on demand)

A Word about Encapsulation

"It's just an encapsulation, get over it" :-)

- **Pros** for encapsulation:
  - Does not change user's packet header
  - Identity of user is always maintained while staying private
  - Middle boxes can maintain flow state due to no header translation
  - Overlay and Underlay address families can be different
  - Debugging and Monitoring always tells you:
    - *From who, from where, to who, to where*
- **Cons** for encapsulation:
  - Packet overhead - but you can decide where you spend it

LISP Encapsulation Format

LISP Inside a 3GPP Diagram

```
+-----------------------------------------------------+
|                          SMF                        |
+-+-----------+- - - - - - - - - - - - - - +---+-------+-+
  |           |      Mapping System       |   |       |
  |           +--+----+----------------+--+   |       |
  N4            |    |                |      N4      N4
  |             |  LISP-CP            |      |       |
  |             |    |                |      |       |
+--+---+        |    | +------+       |      |   +---+--+
| UPF  |        |    | | UPF  +-------------+   | UPF  |
--N3-+------+   |    | +------+       |          +------+-N6--
| XTR  +--LISP-CP-+   +-+ XTR  |      +--LISP-CP-+ XTR  |
+--+-+-+                +-+--+-+                +-+-+--+
   | |                    |  |                  | |
   | +-------LISP-DP-------+  +--------LISP-DP------+ |
   |                                                  |
   +-------------------LISP-DP--------------------+
```

Blue: LISP components
Green: packet forwarding
Red: control messages
Bold White: 3GGP Spec Interfaces

Example Packet Flow

Green = EIDs
Green Node = Unmodified Host
Green Arrow = Not Encapsulated

UE to UE

Red = RLOCs
Red Node = LISP xTR
Red Arrow = Encapsulated

Example Packet Flow

UPFs still used as Internet Gateways

Green = EIDs

Green Node = Unmodified Host

Green Arrow = Not Encapsulated

UE to non-EID Server

Red = RLOCs

Red Node = LISP xTR

Red Arrow = Encapsulated

Example Packet Flow

UPFs don't need to be
in the encapsulated data path

Green = EIDs
Green Node = Unmodified Host
Green Arrow = Not Encapsulated

UE to EID Server

Red = RLOCs
Red Node = LISP xTR
Red Arrow = Encapsulated

Mobility Example

UPFs track current location of UEs without the NGC core storing UE state

Green = EIDs
Green Node = Unmodified Host
Green Arrow = Not Encapsulated

UE roams to gNB

Red = RLOCs
Red Node = LISP xTR
Red Arrow = Encapsulated

Mobility Example

Green = EIDs

Green Node = Unmodified Host

Green Arrow = Not Encapsulated

UE roams to gNB

Red = RLOCs

Red Node = LISP xTR

Red Arrow = Encapsulated

Branch-Point Example

RLOC-record for default-EID:
ELP {gNB, BP-UPF, UPF}

BP-UPF is RTR

Green = EIDs
Green Node = Unmodified Host
Green Arrow = Not Encapsulated

Session Anchoring

Red = RLOCs
Red Node = LISP xTR
Red Arrow = Encapsulated

Hand-Off Performance

- Signaling Approach - LISP PubSub
  - RLOC-set change notifications go to ITR/RTR map-caches
  - *draft-rodrigueznatal-lisp-pubsub-02*
- Non-Signaling Approach - Predictive RLOCs
  - No interaction with mapping system
  - Data packets find roaming EIDs via shortest path to predictive-RLOCs
  - *draft-ietf-lisp-predictive-rlocs-01*

IETF and SDOs

```
Network Working Group                                        D. Farinacci
Internet-Draft                                                lispers.net
Intended status: Experimental                              P. Pillay-Esnault
Expires: September 7, 2018                                    U. Chunduri
                                                         Huawei Technologies
                                                              March 6, 2018


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Abstract

   This specification describes how the LISP architecture and protocols
   can be used in a LTE/5G mobile network to support session survivable
   EID mobility.  A recommendation is provided to SDOs on how to
   integrate LISP into the mobile network.
```

https://datatracker.ietf.org/doc/draft-farinacci-lisp-mobile-network/

LISP Standards Track Status

Close to WG Last Call

LISP Standards Track Status

RFCs (17 hits)		
RFC 6830 *(was draft-ietf-lisp)* **The Locator/ID Separation Protocol (LISP)**	2013-01 75 pages	Experimental RFC Updated by RFC8113
RFC 6831 *(was draft-ietf-lisp-multicast)* **The Locator/ID Separation Protocol (LISP) for Multicast Environments**	2013-01 28 pages	Experimental RFC
RFC 6832 *(was draft-ietf-lisp-interworking)* **Interworking between Locator/ID Separation Protocol (LISP) and Non-LISP Sites**	2013-01 19 pages	Experimental RFC
RFC 6833 *(was draft-ietf-lisp-ms)* **Locator/ID Separation Protocol (LISP) Map-Server Interface**	2013-01 13 pages	Experimental RFC
RFC 6834 *(was draft-ietf-lisp-map-versioning)* **Locator/ID Separation Protocol (LISP) Map-Versioning**	2013-01 21 pages	Experimental RFC
RFC 6835 *(was draft-ietf-lisp-lig)* **The Locator/ID Separation Protocol Internet Groper (LIG)**	2013-01 12 pages	Informational RFC
RFC 6836 *(was draft-ietf-lisp-alt)* **Locator/ID Separation Protocol Alternative Logical Topology (LISP+ALT)**	2013-01 25 pages	Experimental RFC
RFC 7052 *(was draft-ietf-lisp-mib)* **Locator/ID Separation Protocol (LISP) MIB** Errata	2013-10 66 pages	Experimental RFC
RFC 7215 *(was draft-ietf-lisp-deployment)* **Locator/Identifier Separation Protocol (LISP) Network Element Deployment Considerations**	2014-04 30 pages	Experimental RFC
RFC 7834 *(was draft-ietf-lisp-impact)* **Locator/ID Separation Protocol (LISP) Impact**	2016-04 18 pages	Informational RFC
RFC 7835 *(was draft-ietf-lisp-threats)* **Locator/ID Separation Protocol (LISP) Threat Analysis**	2016-04 19 pages	Informational RFC
RFC 7954 *(was draft-ietf-lisp-eid-block)* **Locator/ID Separation Protocol (LISP) Endpoint Identifier (EID) Block**	2016-09 12 pages	Experimental RFC
RFC 7955 *(was draft-ietf-lisp-eid-block-mgmnt)* **Management Guidelines for the Locator/ID Separation Protocol (LISP) Endpoint Identifier (EID) Block**	2016-09 10 pages	Informational RFC
RFC 8060 *(was draft-ietf-lisp-lcaf)* **LISP Canonical Address Format (LCAF)**	2017-02 36 pages	Experimental RFC
RFC 8061 *(was draft-ietf-lisp-crypto)* **Locator/ID Separation Protocol (LISP) Data-Plane Confidentiality**	2017-02 18 pages	Experimental RFC
RFC 8111 *(was draft-ietf-lisp-ddt)* **Locator/ID Separation Protocol Delegated Database Tree (LISP-DDT)**	2017-05 44 pages	Experimental RFC
RFC 8113 *(was draft-ietf-lisp-type-iana)* **Locator/ID Separation Protocol (LISP): Shared Extension Message & IANA Registry for Packet Type Allocations**	2017-03 6 pages	Experimental RFC

Kudos

Appendix A. Acknowledgments

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Plan is to evolve this design in 3GPP, IETF, ETSI and ITU at the same time!