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

- Outer Header
- UDP Header
- LISP Header

16 bytes

- Inner Header
- Payload

LISP xTR Prepend

Host Built

Ciphertext

Underlay Dictates Length

16 bytes

Host Dictates Length
LISP Inside a 3GPP Diagram

Blue: LISP components
Green: packet forwarding
Red: control messages
Bold White: 3GPP Spec Interfaces
Example Packet Flow

NGC does not route EIDs

No packet overhead on RAN

UE to UE

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

Red = RLOCs
Red Node = LISP xTR
Red Arrow = Encapsulated
Example Packet Flow

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

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

UE to non-EID Server
Example Packet Flow

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

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

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

UE to EID Server

Internet

xTR

NGC

mapping system

UPF

UPF

RAN

UE

UE
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

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

UE roams to gNB
Mobility Example

Mapping System notifies UPFs about new UE location without NGC knowing or caring.

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

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

UE roams to gNB

UEs never change their IP address (EID)
Branch-Point Example

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

BP-UPF is RTR

Session Anchoring

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

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
Internet-Draft
Intended status: Experimental
Expires: September 7, 2018

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March 6, 2018

LISP for the Mobile Network
draft-farinacci-lisp-mobile-network-03

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.

LISP Standards Track Status

The Locator/ID Separation Protocol (LISP)
draft-ietf-lisp-rfc6830bis-11

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Close to WG Last Call

Locator/ID Separation Protocol (LISP) Control-Plane
draft-ietf-lisp-rfc6833bis-08

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# LISP Standards Track Status

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Kudos

Appendix A. Acknowledgments

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