Demo: Improvements to LISP Mobile Node Including NAT Traversal

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I. Introduction

The current inter-domain routing architecture faces scalability issues regarding the growth of the active entries in BGP routing tables. Several new naming, addressing, and routing technologies are currently under discussion in the IETF and IRTF. The Locator/Identifier Separation Protocol (LISP) [1] currently draws the most attention and is being developed and standardized in the IETF. It separates global routing from local routing in end-user networks (so-called LISP-domains) (see Figure 1).

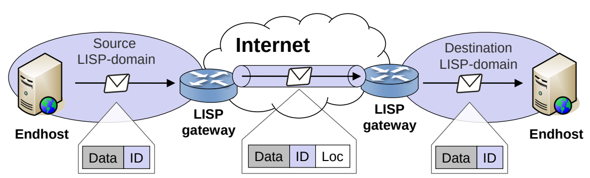

Fig. 1. LISP architecture

LISP requires new gateways but hosts in LISP domains do not need to be changed. Communication sessions with other nodes are established using identifier addresses, which are also used for local routing within a LISP domain. Identifiers (IDs) are not advertised in global BGP routing. Therefore, LISP-gateways add a globally routable locator (Loc) to each packet to send them over the Internet. LISP-gateways request the locator for an ID from a special mapping system. This architecture decouples the combined identification and location functions of today's IP addresses and implements the Loc/ID split principle.

The basic LISP architecture does not support mobility. Recently, the mobility extension LISP Mobile Node (LISP-MN) [2] was presented. It enables mobile nodes to roam into LISP and non-LISP networks while being reachable under the same address. However, mobile nodes are only reachable within a non-LISP network as long as they receive globally routable addresses. A separate NAT traversal mechanism is required in case a non-LISP network uses a NAT gateway and provides only locally routable private addresses.

In [3] we analyzed the encapsulation and forwarding structure of LISP-MN and showed that it needs double mapping lookups in all LISP gateways, leads to triangle routing under some conditions, and requires double encapsulation. To solve these issues, we proposed gradual improvements to LISP-MN that avoid these drawbacks under many conditions. These improvements can be incrementally applied to the LISP architecture. Our improvements may be implemented by individual domains and do not require global adoption in all LISP networks.

To support mobile nodes within a non-LISP network with private addresses, we proposed a NAT traversal mechanism [4]. Each mobile node is configured with an anchor point which serves as relay for control traffic and incoming data traffic. The NAT traversal mechanism does not induce increased complexity at mobile nodes and all new operations are implemented at the anchor point. The anchor point may be collocated with existing devices that are already required for LISP-MN and the general LISP architecture. Hence, our NAT traversal technique does not require additional equipment.

II. EuroView 2010 Demo

We implemented the basic LISP-MN architecture in Omnet++ [5]. In addition, we implemented our improvements and our proposal for NAT traversal to show their viability.

To demonstrate the advantages of our improvements, we run the basic LISP-MN and an upgraded version in parallel in different scenarios and show that double lookups, triangle routing, and double encapsulation are mostly avoided. We explain why mobile nodes in networks behind NATs cannot be reached from other nodes. Our simulation illustrates step-by-step how our proposed NAT traversal solves that problem using a globally reachable anchor point.

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References

[1] D. Farinacci, V. Fuller, D. Meyer, and D. Lewis, "Locator/ID Separation Protocol (LISP)," http://tools.ietf.org/html/draft-ietf-lisp, Apr. 2010.
[2] D. Farinacci, V. Fuller, D. Lewis, and D. Meyer, "LISP Mobility Architecture," http://tools.ietf.org/html/draft-meyer-lisp-mn, Feb. 2010.
[3] Michael Menth, Dominik Klein, and Matthias Hartmann, "Improvements to LISP Mobile Node," in *22nd International Teletraffic Congress (ITC22)*, Amsterdam, The Netherlands, Sep. 2010.
[4] Dominik Klein, Matthias Hartmann, and Michael Menth, "NAT Traversal for LISP Mobile Node," in *under submission*, 2010.
[5] A. Varga and R. Hornig, "An overview of the OMNeT++ simulation environment," in *Proceedings of the 1st international conference on Simulation tools and techniques for communications, networks and systems (Simutools '08)*, Mar. 2008.