http://lib.uliege.be

https://matheo.uliege.be

Master thesis : Simulating LISP with NS3

Auteur : Marechal, Emeline
Promoteur(s) : Donnet, Benoît
Faculté : Faculté des Sciences appliquées

Diplôme : Master : ingénieur civil en informatique, à finalité spécialisée en "computer systems security"
Année académique : 2018-2019
URI/URL : http://hdl.handle.net/2268.2/6737

Avertissement à l'attention des usagers :

Tous les documents placés en accès ouvert sur le site le site MatheO sont protégés par le droit d'auteur. Conformément aux principes énoncés par la "Budapest Open Access Initiative"(BOAI, 2002), l'utilisateur du site peut lire, télécharger, copier, transmettre, imprimer, chercher ou faire un lien vers le texte intégral de ces documents, les disséquer pour les indexer, s'en servir de données pour un logiciel, ou s'en servir à toute autre fin légale (ou prévue par la réglementation relative au droit d'auteur). Toute utilisation du document à des fins commerciales est strictement interdite.

Par ailleurs, l'utilisateur s'engage à respecter les droits moraux de l'auteur, principalement le droit à l'intégrité de l'oeuvre et le droit de paternité et ce dans toute utilisation que l'utilisateur entreprend. Ainsi, à titre d'exemple, lorsqu'il reproduira un document par extrait ou dans son intégralité, l'utilisateur citera de manière complète les sources telles que mentionnées ci-dessus. Toute utilisation non explicitement autorisée ci-avant (telle que par exemple, la modification du document ou son résumé) nécessite l'autorisation préalable et expresse des auteurs ou de leurs ayants droit.

Simulating LISP with NS-3

Author:
Emeline Marechal
emeline.marechal@student.uliege.be

Supervisor:
Pr. Benoit Donnet
benoit.donnet@uliege.be

University of Liège - Faculty of Applied Sciences

Academic year 2018-2019

The *Locator/Identifier Separation Protocol* (LISP) is a novel routing architecture for the Internet that is based on the *locator/identifier separation* paradigm. The principle is to split the current address space into the *identifier* address space, which is composed of locally routable addresses used for identification; and the *locator* address space, composed of globally routable addresses used to route traffic in the network. The main objective is to solve the current Internet's routing scalability problems threatening the network performance. Besides that, LISP also brings several new interesting benefits, in particular for Traffic Engineering (TE), and multi-homing.

Originally, LISP architecture had no support for node mobility. *LISP Mobile Node* (LISP-MN) has thus been developed to introduce mobility extensions to LISP and provide scalable and fast mobility. LISP-MN allows a node to roam from one site to another (whether the site is a LISP site or not), while maintaining ongoing communications at the transport-level. However, there was still no support for sites using Network Address Translation (NAT). Therefore, NAT extensions (LISP+NAT) have been established to define a NAT traversal mechanism for LISP mobile nodes. These extensions enable a node to send and receive LISP traffic, even though it is situated behind a NAT.

So far, little is known about the performance of LISP-MN, and even less about the impact of NAT traversal for LISP traffic. Indeed, both propositions are mainly limited to the theoretical level and lack any experimentation. We aim to provide a first look at this aspect of LISP through simulations on the ns-3 Network Simulator.

To do so, we adapted the existing LISP implementation in ns-3 to add several functionalities to the model. Our main contribution consisted into adding a NAT model, proxy features (interworking mechanism used for communication between LISP sites and non-LISP sites), as well as the NAT extensions (LISP+NAT) to the LISP model. Additionally, we wrote a LISP-MN Helper, meant to help the script writer to easily setup a simulation scenario with mobile nodes and handovers. Finally, several unit tests have been integrated into the ns-3 testing framework for the NAT and LISP models.

After investigation, we saw that all works on NAT traversal for LISP only focused on static scenarios, i.e., scenarios with no roaming and no handover. As such, some important aspects of mobility (the update of remote nodes' state after a roaming event) have been left completely unspecified. We thus propose an extension of the protocol to take handovers into account and define a novel procedure for those cases.

Our results confirm the intuition that NAT traversal has a negative impact on path stretch and on the handover delay. Indeed, most of the time, the handover delay when roaming into a non-LISP site behind a NAT is superior to the handover delay when roaming into a non-LISP site with no NAT deployment.