

A Demonstration of the NORNET CORE Research Testbed for Multi-Homed Systems

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I. MOTIVATION AND INTRODUCTION

Due to the availability of reasonably inexpensive Internet connections, cloud computing is becoming increasingly more popular and widespread. Instead of maintaining servers locally, services are provided by remote virtual servers at data centres. In the recent years, a lot of research work has been done in the area of server redundancy and service migration. However, for many cloud computing users today, the access to the Internet constitutes a single point of failure. That is, if such an Internet connection is broken, all cloud services become unavailable. Further research on network resilience is necessary. The Simula Research Laboratory¹ has therefore established the NORNET project² [1], [2], in order to create an open, multi-site research testbed platform for network resilience and multi-path transport experiments in real Internet setups. Particularly, all NORNET sites are multi-homed, i.e. connected to at least two Internet Service Providers (ISP). NORNET CORE denotes the wired part of the NORNET testbed [3]. The testbed consists of research nodes distributed all over the country of Norway as well as further nodes in Sweden, Germany and China.

In order to illustratively demonstrate the functionalities of NORNET CORE in a multi-site, multi-homed Internet setup, a demonstration platform has been designed and implemented as part of a Masters thesis [4]. The demonstration setup is particularly intended to also show the basic functionalities of NORNET CORE to an audience without a broader knowledge of resilience and multi-path transport. It particularly allows to demonstrate the implications of ISP combinations on QoS performance (bandwidth, delay, etc.), with support for IPv4 and IPv6 as well as state-of-the-art transport protocols like the Stream Control Transmission Protocol (SCTP) as well as Multi-Path TCP (MPTCP).

II. IMPLEMENTATION AND USE

The demonstration system consists of a GUI that allows the users to interactively start, stop and configure remote

components within the testbed and perform small experiments. Particularly, it is possible to live monitor the implications of changes:

- How do the QoS characteristics differ between two sites with the choice of ISPs?
- Which ISP combination is best for a certain application case between two sites?
- Have IPv4 and IPv6 different QoS behaviours?
- Does MPTCP usage provide a benefit?
- ...

With our demonstration system, such questions may be evaluated live, in our real Internet setup. In the GLOBECOM demo session, the interactive GUI will run on a demonstration machine. The audience will furthermore be invited to not only passively view our demonstration of the system but also to interact with the system.

III. FURTHER INFORMATION

For the demo, we need space for two laptop computers (including power) and, if possible, a beamer or a large display. Of course, reliable Internet connectivity is mandatory. We prefer an Ethernet connection, but a *stable and properly working* WLAN connection would also work. IPv6 connectivity is not mandatory but would be nice to have. Details on the demonstration system, including screenshots, are provided in the Masters thesis [4].

REFERENCES

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- [3] T. Dreibholz, "The NorNet Testbed for Multi-Homed Systems – Introduction and Status," Invited Talk at Princeton University, Department of Computer Science, Princeton, New Jersey/U.S.A., May 2014.
- [4] H. V. Simonsen, "A Demonstration Scenario for the NorNet Core Multi-Homed Network Testbed," Master's thesis, University of Oslo, Oslo/Norway, May 2014.

¹Simula Research Laboratory A/S: <https://www.simula.no>.

²NORNET: <https://www.nntb.no>.