Technische Universität München, Department of Informatics

Chair for Network Architectures and Services
Prof. Dr.-Ing. Georg Carle

Thesis B.Sc.

Thesis M.Sc.

IDP

DNS in a Box –
Testing for Reproducible Network Scans

Motivation

Sound Internet measurements and scans (such as DNS, SSH or TLS scans) rely on scanners and other supplementary tools for data aggregation. When developing and deploing these tools the behavior of the tools themselves and the target network are assumed to behave deterministically. This is often not the case which as a result makes the measurements not reproducible.

DNS

DNS in a Box

In this work we want to investigate how we can improve the current situation and enable researchers to reliably and reproducibly test and compare the behavior of their measurement runs. This helps to avoid bugs in the first place and if necessary can serve as a platform to recreate the environment and scenarios that resulted in unexpected behavior.

The first use case is a DNS resolver/scanner developed for large scale Internet scans. Instead of configuring and using virtual machines to emulate complex and large networks we want to completely control and simulate the Internet for the tested applications using a single machine with the help of modern networking features such as tap interfaces, network namespaces, iptables redirection and NFQUEUE. This allows to more easily and targeted model the underlying problem domain (e.g. the DNS scanner does not query private IP addresses, some DNS servers in the Internet send broken packets that cannot be reproduced by regular tools, certain configuration errors depend on a large number of hosts). Existing network emulation frameworks such as Mininet might provide a starting point.

Your Task

- Investigate how diverse networks can be simulated for the application
- Develop and implement such a framework
- Test our existing DNS resolver/scanner in this framework and compare it with other resolvers (BIND, unbound)

Prerequisites

- Python or Go
- Interest in DNS and network measurements
- Basic familiarity with the Linux network stack and openness to learn about advanced features
- You live the GIYF motto

Contact

Johannes Naab   naab@net.in.tum.de
Oliver Gasser   gasser@net.in.tum.de

https://net.in.tum.de/~naab