SCION HTTP(S) Proxy

An HTTP or HTTPS Proxy is useful in a manner of ways. It can cache the content of a website and bring it closer to its users, reducing latency and overall traffic, it reduces network costs, it can provide an additional layer of security and/or privacy, etc.

This project aims to design and build an HTTPS proxy that is also able to *translate* IP traffic into SCION traffic, and additionally allow to configure said proxy indicating it how to reach the intended destination ---via the use of e.g. *path policies*.

Several questions have to be answered in this work:

- Explicit Proxy or Transparent Proxy?
- Existing software or new implementation?
- Can we use QUIC to collate requests/responses when rewriting?

Some requirements we already know:

- Use local cache.
- Rewrite rules exist.
- Path Policies in the rewrite rules.
- Very configurable. E.g. do-not-cache, do-QUIC-collate, etc.
- Listens for IP:TCP:80 and :443. Also for SCION:QUIC:80
- Creation of the SCION→IP translator will also be necessary

The proxy is intended to run in a Linux environment (particularly Ubuntu), and for one to exist in every major ISP. Study of the interaction with the web client is also important.

The proxy is a more specialized component than that of the SIG (SCION IP Gateway), and thus it allows for further optimization and configuration.

Tasks

The main tasks of this project are:

1. Literature Study
    a. Understand the SCION network works.
    b. Understand how a (transparent) proxy works.
    c. Examine existing proxy solutions. In particular, the skip-proxy in scion-apps.
    d. Understand how browsers, in particular Chrome and Firefox, interact with HTTP(s) proxies. Are there RTP interactions? Which hooks can be registered to e.g. add a HTTP header to the request?
2. Design a Solution
    a. How is the HTTP proxy deployed? How does the client interact with it? Do we need interaction with the reverse SCION→IP proxy?
    b. Document it
    c. Implement it
3. Deploy in SCIONLab
    a. As a test network, SCIONLab allows the deployment of research projects. Design a PoC deployable in SCIONLab

Organization

The student will hold weekly meetings with the thesis advisor. During each weekly meeting, the student will be expected to briefly describe the work completed during the week. The student should promptly discuss any complications that arise (e.g. difficulty in understanding concepts or in creating tools) such that the advisor can assist the student in identifying alternative project directions. The advisor will assist the student toward completing any agreed upon milestones, as well as laying out the following week's goals.

Grading Scheme:

Grade	Description
6.00	Design and implementation, as well as thesis are candidates for submission to an academic conference or workshop.
5.50	Thesis quality significantly exceeds expectations.
5.00	Thesis meets expectations.
4.50	Thesis partially meets expectations and has minor deficits.
4.00	Thesis meets minimum quality requirements; but has major deficits and is clearly below expectations

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Zurich, 00.10.2023 Advisor Signature Student Signature