

An implementation of HTTP /HTTPS and SSL for Scheme 48

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Contents

1	Abstract	1
2	Introduction	2
2.1	The Sockets implementations	2
2.2	Issues for the project	2
2.3	The DSL definitions	2
2.4	The SSL syntactic layer	3
3	Procedural interface definitions	3
3.1	The SSL procedural interface in C / Scheme	3
3.2	The HTTP/HTTPS Client side procedural interface in C / Scheme	3
3.2.1	Transport	3
3.2.2	Multipart attachements	3
3.3	The HTTP/HTTPS Server side procedural interface in C / Scheme	3
3.3.1	Transport	3
3.3.2	Multipart attachements	3
4	APPENDIX A: Terminology Explained in short	3
4.1	The HTTP 1.1 / 2 / 3 Protocol	3

1 Abstract

What we like to do is to support **SSL / HTTP / HTTPS** in Scheme 48. The interface for that will be implemented nearly implemented as Domain Specific Language for Networking. I will use LibreSSL and (TODO Fill in) as external Libraries to avoid errors and bugs in the implementation by doing that on my own with much less time than the developers and designers of this components have due to much more manpower. The goal is to implement the **HTTP /1.1** and **HTTP/2** and **HTTP/3** as well. To get something like a pseudo standard, the interface is inspired slightly by the HTTP-EASY Library [HTTP-EASY \(Lib Site\)](#) which is implemented in racket which is also inspired by scheme and which also has an R6RS Scheme standard implemented. The implementation and

interface is committed to the requirements defined by the following RFC Documents:

– [RFC-5246 \(TLS V 1.2\)](#)

The Transport Layer Security (TLS) Protocol Version 1.2 Authors: T. Dierks Independent, E. Rescorla RTFM, Inc.

– [RFC-8446 \(TLS V 1.3\)](#)

The Transport Layer Security (TLS) Protocol Version 1.3 Author(s): E. Rescorla Mozilla

– [RFC-6101 \(SSL V 3.0\)](#)

The Secure Socket Layer (SSL) Protocol Version 3.0 Authors: A. Freier, P. Karlton Netscape Communications, P. Kocher Independent Consultant

– [RFC-3986 \(URI\)](#)

The Uniform Resource Identifier (URI) Authors:
T. Berners-Lee W3C/MIT, R. Fielding Day.
Software, L. Masinter Adobe Systems

– [RFC-9112 \(HTTP/1.1\)](#)

The specification of the Hyper Text Transfer
Protocol / 1.1 (Authors: R. Fielding, Ed. , M.
Nottingham, Ed., J. Reschke, Ed.)

– [RFC-9110 \(HTTP Semantics\)](#)

The semantics specification of the Hyper Text
Transfer Protocol (Authors: R. Fielding, Ed.,
M. Nottingham, Ed., J. Reschke, Ed.)

– [RFC-9113 \(HTTP/2\)](#)

The specification of the Hyper Text Transfer
Protocol / 2 (Authors: M. Thomson, Ed. , C.
Benfield, Ed.)

– [RFC-9114 \(HTTP/3\)](#)

The specification of the Hyper Text Transfer
Protocol / 3(Authors: M. Bishop, Ed.)

In addition to the client library a full functional
toolkit will be implemented for developing
application containers with RESTful¹ interfaces
(e.g. using YAML definitions) or at last my be
application containers and something like OCSP²
Services. This will be really enough for the first
step.

2 Introduction

Scheme 48 is a SCHEME interpreter actually
following the R5RS standard but the R6RS is
nearly ready for delivery. In this implementation
up to now there is a net component implementing
socket communication. The first step to reach our
goal will be to introduce a SSL capable
implementation using the current implementation
for port and channel handling to get an
appropriate layer definition for implementing the
things for HTTP / HTTPS.

Short explanation of the Plain Socket / SSL
Layer: For the SSL Layer we built up a little
syntax with define-syntax, which is a define for a
new generic usable function definition which
contains the protocol definition, the CTX the
Certificate and the connection parameters in a
record after that this command executes a
handshake and open connection in a way that we

get a port number which can be used either by
LibreSSL or by the native C socket API to do
HTTP / HTTPS. Short explanation of the HTTP
/ HTTPS Layer: The HTTPS layer is defined on
top of the SSL Layer by the next `define-syntax`.

2.1 The Sockets implementations

First of all we have to design our interface and
the syntax and attributes and functional syntactic
layout of our tiny DSL. After that it is necessary
to build the low level functionality in C so that
we can then build our things in scheme. I prefer
this way because it is good to see an early success
so that the work is not too long before knowing
that the concept works. The first part that we
develop of course. also as a base for the DSL is a.
procedural interface (function calls).

2.2 Issues for the project

Here are some issues which are important for our
task:

- How read / write is planned
 - Using the new. Port / Channel I/O
written for R6RS
 - Make it stable for multi-threading via
atomically
- We use some kind of pseudo code to
describe the logic here
 - Using the My Lisp dialect / McCarthy
Lisp dialect and formula
- Additional things which we will implement
 - Implement URL encoding
 - Basic and Certificate AUTH Headers
 - Implement base for RESTful services
including yaml like definition and
JSON support
 - Implement MULTIPart attachemenzs
with MIME spec.

¹**REST Requests:**The *RepresEntational abbrhighcolState abbrhighcolTransfer* API is an architectural style and the RESTful services follows this specification to design a special form of HTTP requests.

²**OCSP:** The *Open Certificate Service Protocol* is used to implement servers being requested using OCSP Requests and defined OCSP Responses for checking the correctness and the validity of a certificate.

2.3 The DSL definitions

The DSL³ for the SSL Layer itself will be designed by using the define-syntax and the other hygienic macro functionality.

A Domain specific language has to be defined in a way that the Function / Keywords can be used inside the definition of the syntax for the DSL

2.4 The SSL syntactic layer

At first we need a syntax to declare a Socket~~Plain~~/ *SSL*. Here we have to think about connection parameters and about parameters and attributes for *SSL* / *TLS* (e.g. *CTX* and certificate keys and a specific Algorithm for transport. The *CTX* will be a structure/ record-type as well as the definition of the base connection parameters.

3 Procedural interface definitions

3.1 The SSL procedural interface in C / Scheme

3.2 The HTTP/HTTPS Client side procedural interface in C / Scheme

3.2.1 Transport

3.2.2 Multipart attachements

3.3 The HTTP/HTTPS Server side procedural interface in C / Scheme

3.3.1 Transport

3.3.2 Multipart attachements

4 APPENDIX A: Terminology Explained in short

4.1 The HTTP 1.1 / 2 / 3 Protocol

The HTTP⁴ protocol has its origin in

³*DSL*: A *Domain Specific Language* is a language normally built up in the host language. A DSL is designed for special tasks and areas e.g.: Windowing.

⁴*HTTP*: The *H*yper *T*ext *T*ransport *P*rotocol used for transport e.g. *HTML* or designing *REST Requests*. The protocol is implemented by all Web Browsers and is used all over the internet to transport / requesting and servicing data in a structured form with defined requests like *GET*, *PUT*, *DELETE*, *HEAD*. All of these requestshave a defined response format.