Challenge-Response Authentication Method for SOCKS V5

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Abstract

This document specifies a general Challenge-Response Authentication Method (CRAM) for use with SOCKS Version 5 [RFC 1928]. It is intended to support various challenge-response mechanisms, such as S/KEY and OTP [RFC 1938] as well as authentication tokens.

Introduction

The protocol specification for SOCKS Version 5 [RFC 1928] specifies a generalized framework for the use of arbitrary authentication protocols in the initial SOCKS connection setup. This document suggests a general framework for a Challenge-Response Authentication Method (CRAM) as it fits into the SOCKS Version 5 authentication "subnegotiation."

Initial Negotiation

During initial SOCKS V5 negotiation, the client and server negotiate the authenticiation method. The METHOD for this protocol shall be X’05’.
Challenge-Response Framework

Subnegotiation begins after the client has selected the CRAM authentication method.

Message Format

In general, messages exchanged consist of a version identifier and a list of attribute-value assertions, where attributes are single octets and values are sequences of 0-255 octets.

```
| VER | NAVAS | ATT1 | VAL1LEN | VAL1 | ATT2 | ... |
+-----+-------+------+---------+------+------+---
  1   |   1   |   1  |    1    | 0-255|  1   | ...
+-----+-------+------+---------+------+------+---
```

VER contains the current version of the subnegotiation, which is X'01'. NAVAS contains the number of attribute-value assertions to follow. Each AVA includes ATT_i, containing the attribute, VAL_iLEN, containing the length of VAL_i, and VAL_i. In general, robust implementations should ignore assertions with attributes they do not understand. This provides a powerful and general mechanism for future extensions while allowing backward compatibility.

Notationally, a single message with a list of n assertions shall be represented as:

```
ATT_1(VAL_1), ATT_2(VAL_2), ... ATT_n(VAL_n)
```

Attributes

The following attribute definitions apply to all messages:

<table>
<thead>
<tr>
<th>ATT</th>
<th>Label</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>X'00'</td>
<td>STATUS</td>
<td>0 = success</td>
</tr>
<tr>
<td>X'01'</td>
<td>TEXT-MESSAGE</td>
<td>Informational text</td>
</tr>
<tr>
<td>X'02'</td>
<td>USER-IDENTITY</td>
<td></td>
</tr>
<tr>
<td>X'03'</td>
<td>CHALLENGE</td>
<td></td>
</tr>
<tr>
<td>X'04'</td>
<td>RESPONSE</td>
<td></td>
</tr>
<tr>
<td>X'05'</td>
<td>CHARSET</td>
<td></td>
</tr>
</tbody>
</table>

The TEXT-MESSAGE attribute may always be included in any message (except submethod negotiation.) Implementations should display its contents to the user if applicable; it should be used for advisory information (e.g. warnings of pending password expiration, explanations accompanying a failure.) If there is no user,
implementations may log its contents.

The CHARSET attribute provides advisory information about the character set in use; it, too, may be present in any message. Implementations should use it to guide presentation of information to users. The semantics are identical to that of the charset parameter in MIME [RFC 1521]; if absent, a default of ISO-8859-1 should be assumed.

Submethods may also define their own additional attributes, but must not redefine the above standard ones.

Protocol Exchange

Generic challenge-response simply authenticates the client’s identity by sending a textual challenge from the server which the client displays to the user. The user somehow (e.g. by using an external application or a security token) computes the appropriate response and enters it.

First, the client asserts its identity to the server:

    USER-IDENTITY(<username>)

The server then responds with a textual challenge to be displayed to the user:

    CHALLENGE(<challenge>)

The client displays this challenge, prompts for a response, and sends it:

    RESPONSE(<response>)

The server may respond with a new challenge method, for which a new response is required. Arbitrarily many challenges may be issued. When the server finished issuing challenges, it sends a status message:

    STATUS(success|failure)

and the subnegotiation terminates. If the authentication did not succeed, the server must drop the connection.

Security Considerations

Challenge-response protocols are generally designed to provide protection from passive attacks such as sniffing passwords. The security mechanisms here generally offer only limited protection from
real-time active attacks.

In most challenge-response security mechanisms, it is important that challenges be produced in a fashion an adversary cannot predict or duplicate. As with all negotiation-based security, implementations may be vulnerable to downgrade attacks. Clients and servers should refuse to operate with methods and algorithms considered insufficiently secure.

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References


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