GSSAPI authentication for HTTP
draft-johansson-http-gss-05

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Abstract

This document specifies a template extension to the HTTP Negotiate authentication mechanism defined in RFC4559 which supports mutual authentication, fast session-based re-authentication and channel bindings. An IANA registry for such GSS-API HTTP authentication mechanisms is defined.

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1. Terminology

The keywords "MUST", "MUST NOT", "REQUIRED", "SHOULD", "SHOULD NOT" and "MAY" that appear in this document are to be interpreted as described in [RFC2119]
2. Introduction and motivation

[RFC4559] describes an authentication mechanism based on SPNEGO for HTTP. This mechanism suffers from a couple of drawbacks, notably:

Only supports single-round-trip GSS-API mechanisms due to lack of support for proxies.

Lack of channel bindings to the underlying HTTPS connection which makes in unsuitable for deployment in situations where proxies exists.

Lack of session-based re-authentication (compare with TLS).

This document is intended to solve these problems by introducing a new authentication mechanism called ‘GSS’. This mechanism is a proper extension of Negotiate but since Negotiate is already widely deployed this mechanism was given a separate name.
3. HTTP GSS Authentication Mechanism

The GSS mechanism is an authentication mechanism for [RFC2616] based on a multi-roundrip handshake using base64-encoded GSS-API [RFC2743] tokens encoded in the WWW-Authenticate Response Header and the Authorization Request Header. An important difference from [RFC4559] is that multiple round trips are supported which means that the server can be authenticated to the client (aka mutual authentication). This document specifies a template authentication mechanism with an associated IANA registry which provides input parameters to the HTTP authentication mechanism described below.

3.1. GSS Token Header Syntax

Both the Authorization and the WWW-Authenticate headers use the same syntax throughout the handshake (cf below for details on the protocol flow) specified by this Augmented BNF following [RFC2617] and [RFC2616]:

```
challenge = auth-scheme-name 1*SP 1#auth-param
auth-scheme-name = token
auth-param = ( auth-data-value | auth-param-type "=" auth-param-value )
auth-param-value = ( token | quoted-string )
auth-param-type = ( "auth-data" | "context-identifier" )
auth-data-value = 1*(UPALPHA|DIGIT) ;base64-encoded
context-identifier-value = 1*(UPALPHA|DIGIT) ;base64-encoded
```

The auth-param types defined by this specification (auth-data and context-identifier) both have auth-param-value which contain base64 encoded data. Note that both the auth-data and context-identifier auth-param may be absent. The semantics of these parameters will be explained below. Each auth-param-type MUST NOT occur more than once in a single challenge.

The auth-scheme-name token is the name of the mechanism and is supplied in the IANA registry template described below.

For reasons of backwards compatibility with [RFC4559] two forms of the auth-param are allowed - one version based on attribute-parameter pairs and one where only GSS-API data is sent.

3.2. Naming and Transport

The GSS name of the server is "HTTP@<hostname>[:port]" where the :port part is absent if the port == 80 or if the port == 443.

This mechanism SHOULD be used together with an HTTP transport
providing session protection and encryption such as [RFC2817] or [RFC2818]. Session protection is a requirement for fast re-authentication described below.

Like [RFC4559] the mechanism described in this specification is based on mapping the GSS-API protocol to HTTP requests and responses where the GSS-API tokens are sent in the Authorization and WWW-Authentication headers. Unlike [RFC4559] the entire handshake need not take place using a single TCP connection or a single HTTP/1.1 session. Instead opaque identifiers in the GSS challenge option field are optionally used together with channel bindings to provide a way to share a security context over several HTTP connections. This mechanism also serves as a way to let the client do a fast re-authentication to the server.

3.3. Protocol Flow

3.3.1. Initiating authentication

Normally the server initiates an authentication handshake when the client attempts to access a protected resource. The exception is when the client knows that it is accessing a protected resource and that the server supports the GSS mechanism, for instance when fast re-authentication is attempted by the client (cf below). In both cases the GSS-API negotiation is initiated by the client - i.e if the server initiates the authentication it is only to inform the client that authentication is required. The client SHOULD request mutual authentication from the GSS-API layer.

Note that the first request by the client to a protected resource will also serve to let the client and server establish channel bindings in the sense of [RFC5056] using the ‘tls-server-end-point’ CB type which means that this first request is not in general "wasted" even in the case when the client has no prior knowledge about the server or is attempting fast re-authentication.

If the client tries to access a protected resource the server may return a code 401 response with an WWW-Authenticate header containing a list of authentication challenges allowing the client to choose among different authentication mechanisms supported by the server. If the server supports the mechanism specified by the auth-scheme-name the server returns a challenge with only the auth-scheme-name part and no parameters along with any other challenges for mechanisms supported by the server. This first request also allows the client and server to establish channel-bindings.
3.3.2. The authentication phase

In each case below when GSS-API tokens resulting from calls into the GSS-API layer are sent from the server to the client or vice-versa, the token is encoded using base64 and sent as the "auth-data" parameter value of the Authorization and WWW-Authenticate headers respectively.

A client initiates the authentication phase by sending the token resulting from the first call to gss_init_security_context to the server.

Upon receipt of token (i.e a request with an accompanying Authenticate header with non-empty "auth-data" parameter value), the server MUST return the token resulting from a call to gss_accept_security_context in a code 401 response, unless the call to gss_accept_security_context fails in which case a code 403 response is returned.

If the underlying transport provides session protection (e.g., HTTPS) and if channel-bindings are in place (cf. below) then the server MAY include a unique identifier of the security context being negotiated (or having been negotiated in the case of the last transaction) in the "context-identifier" parameter value. The server MUST uniquely associate this identifier with the client and the security context.

Upon receipt of a code 401 response from the server when the WWW-Authenticate header contains a non-empty "auth-data" parameter value, the client MUST return the token resulting from a call to gss_initiate_security_context to the server in a new request to the same resource. If the call fails the client MUST close the connection. If a "context-identifier" parameter value is present in the response from the server the client MUST include this in the ensuing request as the "context-identifier" parameter value. If the "context-identifier" parameter value is not present in the response from the server the client MUST use the same HTTP/1.1 connection for the entire handshake. If the client breaks the HTTP/1.1 connection the server MUST invalidate the security context unless a context identifier was sent to the client and returned to the server.

A client may close the connection both as the result of using the context-identifier to spread the authentication over several underlying connections or as the result of a failed call to gss_initiate_security_context. This might at first seem like a problem but the GSS-API layer combined with proper handling of the context identifier will ensure that handling of these cases are disambiguated at the server.
The client and server continues the handshake until either an error occurs (in which case a 403 is returned to the client or the client closes the connection depending on where the error happens) or the GSS-API layer has successfully completed the negotiation in which case the server sends a normal response to the client. If the last call to gss_accept_sec_context on the server resulted in a non-empty token the server MUST include this in a WWW-Authenticate header in the response to the client regardless of the return code which is being sent to the client. If the underlying transport provides session protection (e.g., HTTPS) and if channel-bindings are in place (cf. below) then the server MAY include a "context-identifier" parameter value uniquely identifying the established security context. The server MAY decide to limit the validity of the established context and MAY choose not to consider references to the context after a certain amount of time (cf. below).

If the client receives a normal response with an non-empty "auth-data" parameter value the client MUST call gss_initiate_sec_context with this token as input to complete the authentication handshake. If the final response contains a "context-identifier" parameter value the client may cache it and use it to provide fast re-authentication by including it in an Authorization header with auth-scheme-name and empty "auth-data" parameter value.

3.3.3. The authorization phase

Authorization failures can occur even if the client is successfully authenticated to the server. In this case the server will send a 403 response to the client even though the GSS-API handshake has succeeded. It is important to let the client and server finish the authentication handshake even if the client is not authorized to access the resource. Therefore the client MUST call gss_initiate_sec_context with any GSS-API token returned to the client, even if the token was sent along with a 403 response.

During authorization the server MAY use the GSS-API name associated with the established security context for authorization decisions and should provide a string representation of the GSS-API name as the REMOTE_USER meta-variable and the auth-scheme-name as the AUTH_TYPE meta-variable if the Common Gateway Interface (CGI) is provided by the server.

3.3.4. Fast Renegotiation

Upon receipt of a request containing an Authorization header with the auth-scheme-name, an empty auth-data and the context-identifier parameter value, the server MUST verify that the identifier references a valid security context. If the security context is
missing or invalid the server MUST return a 401 response prompting
the client to re-negotiate the security context. If the identifier
references a valid security context the server MUST process the
request as if the client had just completed the full authentication
handshake.

When this process is completed the client is authenticated to the
server and possibly (depending on the way the GSS-API layer was
called and which GSS-mechanism was used) the server is authenticated
to the client.

The use of fast renegotiation is optional and clients and servers
MUST NOT assume that this feature is supported.
4. Examples

TODO
5. Implementation Notes

The context-identifier could be produced by exporting the security context through gss_export_sec_context which requires that the GSS-API implementation supports exporting unfinished contexts.
6. Security Considerations

Should channel-bindings be absent, the protocol is subject to a MITM attack unless the authentication is between a client and a server with no proxies in between and each request is sent over the same HTTP/1.1 connection.

If fast re-authentication is used together with GSS-API credentials delegation the server will need to associate forwarded credentials with the negotiated security context. This presents a challenge for server implementors since it must be guaranteed that security states and their associated credentials must be separated from each other.
7. Notes & TODO

Examples
8. IANA Considerations

IANA will create a new registry for HTTP authentication mechanisms based on this document. The purpose of the registry is to bind the HTTP authentication mechanism name (auth-scheme-name in the syntax above) to the GSS-API mechanism OID. Such HTTP authentication mechanisms will be called GSS-API HTTP authentication mechanisms.

Names for GSS-API HTTP authentication mechanisms must follow the token syntax of section 2.2 of [RFC2616].

The procedure detailed in the section below is to be used for registration of a value naming a specific GSS-API HTTP authentication mechanism.

8.1. Registration Procedure

Registration of a new GSS-API HTTP authentication mechanism requires expert review as defined in BCP 26 [RFC2434]. Registration of a GSS-API HTTP authentication mechanism is requested by filling in the following template:

Subject: Registration of GSS-API HTTP authentication mechanism X

GSS-API HTTP authentication mechanism name:

GSS-API mechanism OID:

Description or Published Specification:

State management: (one of INTERNAL or EXTERNAL)

Intended usage: (one of COMMON, LIMITED USE, OBSOLETE)

Person and email address to contact for further information:

Change manager name and email address:

Expert reviewer name and contact information: (leave blank)

Note: (Any other information deemed relevant)

and sending it via electronic mail to <gss-http@ietf.org> (a public mailing list) and carbon copying (cc:) IANA at <iana@iana.org>.

After allowing new fewer than 2 weeks for community input on the mailing list to be determined, an expert will determine the appropriateness of the registration request and either approve or disapprove the request with notice to the requester, the mailing list...
and IANA.

If the registration was approved the expert adds her name to the submitted registration.

The expert is responsible for making sure that GSS-API authentication scheme names are unique among all HTTP authentication mechanism names and represent an appropriate name for the underlying GSS-API mechanism.

Authors are encouraged to pursue community review by posting the technical specification as an Internet-Draft and soliciting comment by posting to appropriate IETF mailing lists.

8.2. Change Control

Once a GSS-API HTTP authentication mechanism has been published by IANA, the author may request a change to its definition. The change request follows the same procedure as the registration request. The change manager is part of the registration template and controls who may request changes to the registration. Passing control of a registration is also accomplished by submitting a change request.

The IESG may also reassign control and responsibility for GSS-API HTTP authentication mechanism registrations. This is expected to happen when the author of a registration has died, has moved out of contact, or is otherwise unable to make changes to the registered mechanism(s). Furthermore the IESG is the owner of all GSS-API HTTP authentication mechanisms that correspond to specifications on the IETF standards track.
9. Changes

9.1. 00 to 01

   Changed from ABNF to Augmented BNF to align with [RFC2616].

9.2. 02 to 03

   Added reference to rfc 5056.

   Reference to tls-server-end-point channel binding mechanism.

9.3. 03 to 04

   Generalized to IANA-controlled registry of authentication mechanisms.
   Wrote IANA considerations section. Generalized the ABNF to cover old
   Negotiate case which can now be turned into an IANA registration
   covered by this specification.
10. References

10.1. Normative References


10.2. Informative References

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