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Using TLS 1.3 with HTTP/2
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Abstract

This document clarifies the use of TLS 1.3 post-handshake authentication and key update with HTTP/2.

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[1.](#) Introduction

TLS 1.2 [[RFC5246](#)] and earlier support renegotiation, a mechanism for changing parameters and keys partway through a connection. This was sometimes used to implement reactive client authentication in HTTP/1.1 [[RFC7230](#)], where the server decides whether to request a client certificate based on the HTTP request.

HTTP/2 [[RFC7540](#)] multiplexes multiple HTTP requests over a single connection, which is incompatible with the mechanism above. Clients cannot correlate the certificate request with the HTTP request which triggered it. Thus, [section 9.2.1 of \[RFC7540\]](#) forbids renegotiation.

TLS 1.3 [[RFC8446](#)] updates TLS 1.2 to remove renegotiation in favor of separate post-handshake authentication and key update mechanisms. The former shares the same problems with multiplexed protocols, but has a different name. This makes it ambiguous whether post-handshake authentication is allowed in TLS 1.3.

This document clarifies that the prohibition applies to post-handshake authentication but not to key updates.

[2.](#) Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14 \[RFC2119\] \[RFC8174\]](#) when, and only when, they appear in all capitals, as shown here.

[3.](#) Post-Handshake Authentication in HTTP/2

The prohibition on renegotiation in [section 9.2.1 of \[RFC7540\]](#) additionally applies to TLS 1.3 post-handshake authentication. HTTP/2 servers MUST NOT send post-handshake TLS 1.3 CertificateRequest messages. HTTP/2 clients MUST treat TLS 1.3 post-

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handshake authentication as a connection error (see [section 5.4.1 of \[RFC7540\]](#)) of type PROTOCOL_ERROR.

[RFC7540] permitted renegotiation before the HTTP/2 connection preface to provide confidentiality of the client certificate. TLS 1.3 encrypts the client certificate in the initial handshake, so this is no longer necessary. HTTP/2 servers MUST NOT send post-handshake TLS 1.3 CertificateRequest messages before the connection preface.

The above applies even if the client offered the "post_handshake_auth" TLS extension. This extension is advertised independently of the selected ALPN protocol [\[RFC7301\]](#), so it is not sufficient to resolve the conflict with HTTP/2. HTTP/2 clients that also offer other ALPN protocols, notably HTTP/1.1, in a TLS ClientHello MAY include the "post_handshake_auth" extension to support those other protocols. This does not indicate support in HTTP/2.

[4.](#) Key Updates in HTTP/2

[Section 9.2.1 of \[RFC7540\]](#) does not extend to TLS 1.3 KeyUpdate messages. HTTP/2 implementations MUST support key updates when TLS 1.3 is negotiated.

[5.](#) Security Considerations

This document clarifies how to use HTTP/2 with TLS 1.3 and resolves a compatibility concern when supporting post-handshake authentication with HTTP/1.1. This lowers the barrier for deploying TLS 1.3, a major security improvement over TLS 1.2. Permitting key updates allows key material to be refreshed in long-lived HTTP/2 connections.

[6.](#) IANA Considerations

This document has no IANA actions.

7. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
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