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An Alt-Svc Parameter and SvcParamKey for QUIC Versions

Abstract

HTTP Alternative Services (Alt-Svc) describes how one origin's resource can be accessed via a different protocol/host/port combination. Alternatives are advertised by servers using the Alt-Svc header field or the ALTSVC frame. This includes a protocol name, which reuses Application Layer Protocol Negotiation (ALPN) codepoints. The "h3" codepoint indicates the availability of HTTP/3. A client that uses such an alternative first makes a QUIC connection. However, without a priori knowledge of which QUIC version to use, clients might incur a round-trip latency penalty to complete QUIC version negotiation, or forfeit desirable properties of a QUIC version. This document specifies a new Alt-Svc parameter that specifies alternative supported QUIC versions, which substantially reduces the chance of this penalty.

Similarly, clients can retrieve additional instructions about access to services or resources via DNS SVCB and HTTP Resource Records. This document also defines a new SvcParamKey for these Resource Records, which specifies the specific QUIC versions in use.

About This Document

This note is to be removed before publishing as an RFC.

The latest revision of this draft can be found at <https://martinduke.github.io/quic-version-alt-svc-parameter/draft-duke-httpbis-quic-version-alt-svc.html>. Status information for this document may be found at <https://datatracker.ietf.org/doc/draft-duke-httpbis-quic-version-alt-svc/>.

Discussion of this document takes place on the HTTP Working Group mailing list (<mailto:ietf-http-wg@w3.org>), which is archived at <https://lists.w3.org/Archives/Public/ietf-http-wg/>.

Source for this draft and an issue tracker can be found at <https://github.com/martinduke/quic-version-alt-svc-parameter>.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on 23 October 2023.

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1. Introduction

HTTP Alternative Services (Alt-Svc) [[ALTSVC](#)] describes how one origin's resource can be accessed via a different protocol/host/port combination. Alternatives are advertised by servers using the Alt-Svc header field or the ALTSVC frame. This includes a protocol name, which reuses codepoints from the Application-Layer Protocol Negotiation (ALPN) TLS extension [[RFC7301](#)]. Servers can advertise multiple alternatives, in which case the order reflects the server's preferences (the first value being the most preferred).

Clients can ignore alternative services, or pick one at their discretion. A client might use any details from the advertisement, in addition to out of band information, in determining if an alternative is suitable or preferred.

While ALPN was originally intend to allow multiple applications to utilize TLS or DTLS on the same IP address and TCP or UDP port, ALPN can also usefully identify the transport in an Alt-Svc context. The "h3" ALPN codepoint informs the client that it can use HTTP/3 [[RFC9114](#)] for access, which in turn requires the QUIC transport protocol [[RFC8999](#)].

QUIC is versioned. A client and server that both support a QUIC version can, through a negotiation process, generally agree on that version in no more than one round-trip. However, to avoid that penalty clients might use the most commonly deployed QUIC version (e.g. version 1 [[RFC9000](#)] at the time of writing), rather than the version with the most desirable properties for the client's use case.

To avoid the round-trip, one solution would be to register unique ALPN codepoints for each HTTP/3 and QUIC version combination. However, this might complicate deployment of new versions and deprecation of old ones: architecturally, an application should provide its ALPN to its QUIC implementation. In this case, fully deploying a new version in that implementation would require updating all applications that use it.

Instead, this document specifies an Alt-Svc parameter that lists the QUIC versions available to serve the resource. Clients that do not understand this parameter will ignore it. They might default to the most likely version, and/or incur a round-trip penalty in the event of a mismatch. Clients that do process the parameter will connect successfully using the most desirable version with high probability.

Domain Name System (DNS) Service Binding (SVCB) and HTTPS Resource Records [[I-D.ietf-dnsop-svcb-https](#)] allow the distribution of access instructions beyond the IP address via DNS. This document also

specifies a new SvcParamKey for these Resource Records to distribute QUIC version information with this technique.

2. Conventions and Definitions

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.

This document uses the Augmented BNF defined in [[RFC5234](#)] and imports parameter from [Section 3](#) of [[ALTSVC](#)].

3. The quicv Parameter

This document specifies the "quicv" Alt-Svc parameter, which lists the QUIC versions supported by an endpoint, using the hexadecimal representation of the version field in a QUIC long header, as indicated in [[RFC8999](#)]. Senders **MAY** omit leading zeroes from version numbers.

```
quicv          = version-list
version-list   = DQUOTE version 1*( OWS, "," OWS version-number) DQUOTE
version        = 1*8 HEXDIG; hex-encoded QUIC version
```

Examples:

```
Alt-Svc: h3=":443"; quicv="1"
Alt-Svc: h3=":443"; quicv="709a50c4,1"
Alt-Svc: h3=":443"; quicv="709a50c4,1", h3=":1001"; quicv="709a50c4"
```

The order of entries in version-list reflects the server's preference (with the first value being the most preferred alternative).

Note that the quicv parameter applies to a single associated entry in the Alt-Svc list. Servers **MUST NOT** provide a quicv parameter to an entry containing ALPN codepoint that does not potentially utilize QUIC.

If the Alt-Svc information resolves to a server pool that inconsistently supports different QUIC versions, the parameter **SHOULD** only advertise versions that are supported throughout the pool.

4. The quicv SvcParamKey

SVCB and HTTPS Resource Records can include the quicv SvcParamKey. Its presentation format value and use are identical to the quicv

Alt-Svc Parameter. Its wire format value consists of the version numbers in network byte order.

To include the quicv SvcParamKey in a resource record, it **MUST** also include at least one ALPN that can be delivered over QUIC.

For example, consider a service configuration that advertises two QUIC versions on the default port, but only one version on a non-default port.

In Alt-Svc, this could be represented as:

```
Alt-Svc: h3=":443"; quicv="709a50c4,1", h3=":1001"; quicv="709a50c4"
```

As HTTPS RRs, this could be represented as:

```
example.com IN HTTPS 1 . alpn=h2,h3 quicv=709a50c4,1
example.com IN HTTPS 1 . alpn=h3 port=1001 quicv=709a50c4
```

5. Security Considerations

This document inherits the security considerations of [[ALTSVC](#)], especially the implications of "Changing Protocols" in Section 9.3. There are few protocol properties guaranteed to hold across all QUIC versions, so endpoints should be aware what capabilities are intrinsic to the QUIC versions they are advertising.

This parameter reveals capabilities of the described server, but this information is already available by inducing the server to generate a QUIC version negotiation packet.

6. IANA Considerations

Please add this entry to the HTTP Alt-Svc Parameter Registry:

Alt-Svc Parameter: quicv

Reference: This document

Please add this entry to the Service Binding (SVCB) Parameter Registry:

Number: TBD

Name: quicv

Meaning: Supported QUIC versions

Format Reference: This document

Acknowledgments

Thanks to Ben Schwartz for his help with the Resource Record formatting.

References

Normative References

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Appendix A. Change Log

RFC Editor's Note: Please remove this section prior to publication of a final version of this document.

A.1. since draft-duke-httpbis-quick-version-alt-svc-01

*No changes

A.2. since draft-duke-httpbis-quick-version-alt-svc-00

*Added SVCB and HTTPS Resource Records

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