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Application Layer Protocol Negotiation for Web Real-Time Communications
(WebRTC)
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Abstract

Application Layer Protocol Negotiation (ALPN) labels are defined for use in identifying Web Real-Time Communications (WebRTC) usages of Datagram Transport Layer Security (DTLS). Labels are provided for identifying a session that uses a combination of WebRTC compatible media and data, and for identifying a session requiring confidentiality protection.

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[1.](#) Introduction

Web Real-Time Communications (WebRTC) [[I-D.ietf-rtcweb-overview](#)] uses Datagram Transport Layer Security (DTLS) [[RFC6347](#)] to secure all peer-to-peer communications.

Identifying WebRTC protocol usage with Application Layer Protocol Negotiation (ALPN) [[RFC7301](#)] enables an endpoint to positively identify WebRTC uses and distinguish them from other DTLS uses.

Different WebRTC uses can be advertised and behavior can be constrained to what is appropriate to a given use. In particular, this allows for the identifications of sessions that require confidentiality protection.

[1.1.](#) Conventions and Terminology

At times, this document falls back on shorthands for establishing interoperability requirements on implementations: the capitalized words "MUST", "SHOULD" and "MAY". These terms are defined in [[RFC2119](#)].

[2.](#) ALPN Labels for WebRTC

The following identifiers are defined for use in ALPN:

webrtc: The DTLS session is used to establish keys for a Secure Real-time Transport Protocol (SRTP) - known as DTLS-SRTP - as described in [[RFC5764](#)]. The DTLS record layer is used for WebRTC data channels [[I-D.ietf-rtcweb-data-channel](#)].

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c-webrtc: The DTLS session is used for confidential WebRTC communications, where peers agree to maintain the confidentiality of the media, as described in [Section 3](#). However, data provided over data channels does not receive confidentiality protection.

Both identifiers describe the same basic protocol: a DTLS session that is used to provide keys for an SRTP session in combination with WebRTC data channels. Either SRTP or data channels could be absent. The data channels send Stream Control Transmission Protocol (SCTP) [[RFC4960](#)] over the DTLS record layer, which can be multiplexed with SRTP on the same UDP flow. WebRTC requires the use of Interactive Communication Establishment (ICE) [[RFC5245](#)] to establish the UDP flow, but this is not covered by the identifier.

A more thorough definition of what WebRTC communications entail is included in [[I-D.ietf-rtcweb-transports](#)].

There is no functional difference between the identifiers except that an endpoint negotiating "c-webrtc" makes a promise to preserve the confidentiality of the media it receives.

A peer that is not aware of whether it needs to request confidentiality can use either form. A peer in the client role MUST offer both identifiers if it is not aware of a need for confidentiality. A peer in the server role SHOULD select "webrtc" if it does not prefer either.

3. Media Confidentiality

Private communications in WebRTC depend on separating control (i.e., signaling) capabilities and access to media [[I-D.ietf-rtcweb-security-arch](#)]. In this way, an application can establish a session that is end-to-end confidential, where the ends in question are user agents (or browsers) and not the signaling application.

Without some form of indication that is securely bound to the session, a WebRTC endpoint is unable to properly distinguish between session that requires confidentiality protection and one that does not. The ALPN identifier provides that signal.

A browser is required to enforce confidentiality using isolation controls similar to those used in content cross-origin protections (see [Section 5.3](#) [[1](#)] of [[HTML5](#)]). These protections ensure that media is protected from applications. Applications are not able to read or modify the contents of a protected flow of media. Media that is produced from a session using the "c-webrtc" identifier MUST only be displayed to users.

These confidentiality protections do not apply to data that is sent using data channels. Confidential data depends on having both data sources and consumers that are exclusively browser- or user-based. No mechanisms currently exist to take advantage of data confidentiality, though some use cases suggest that this could be useful, for example, confidential peer-to-peer file transfer. Alternative labels might be provided in future to support these use cases.

Generally speaking, ensuring confidentiality depends on authenticating the communications peer. This mechanism explicitly does not define a specific authentication method; a WebRTC endpoint that accepts a session with this ALPN identifier **MUST** respect confidentiality no matter what identity is attributed to a peer.

RTP middleboxes and entities that forward media or data cannot promise to maintain confidentiality. Any entity that forwards content, or records content for later access by entities other than the authenticated peer, **SHOULD NOT** offer or accept a session with the "c-webrtc" identifier.

4. Security Considerations

Confidential communications depends on more than just an agreement from browsers.

Information is not confidential if it is displayed to those other than to whom it is intended. Peer authentication [[I-D.ietf-rtcweb-security-arch](#)] is necessary to ensure that data is only sent to the intended peer.

This is not a digital rights management mechanism. Even with an authenticated peer, a user is not prevented from using other mechanisms to record or forward media. This means that (for example) screen recording devices, tape recorders, portable cameras, or a cunning arrangement of mirrors could variously be used to record or redistribute media once delivered. Similarly, if media is visible or audible (or otherwise accessible) to others in the vicinity, there are no technical measures that protect the confidentiality of that media. In other cases, effects might not be temporally localized: transmitted smells could linger for a period after communications cease.

The only guarantee provided by this mechanism and the browser that implements it is that the media was delivered to the user that was authenticated. Individual users will still need to make a judgment about how their peer intends to respect the confidentiality of any information provided.

On a shared computing platform like a browser, other entities with access to that platform (i.e., web applications), might be able to access information that would compromise the confidentiality of communications. Implementations MAY choose to limit concurrent access to input devices during confidential communications session.

For instance, another application that is able to access a microphone might be able to sample confidential audio that is playing through speakers. This is true even if acoustic echo cancellation, which attempts to prevent this from happening, is used. Similarly, an application with access to a video camera might be able to use reflections to obtain all or part of a confidential video stream.

5. IANA Considerations

The following two entries are added to the "Application Layer Protocol Negotiation (ALPN) Protocol IDs" registry established by [\[RFC7301\]](#):

webrtc:

The "webrtc" label identifies mixed media and data communications using SRTP and data channels:

Protocol: WebRTC Media and Data

Identification Sequence: 0x77 0x65 0x62 0x72 0x74 0x63 ("webrtc")

Specification: This document (RFCXXXX)

c-webrtc:

The "c-webrtc" label identifies confidential WebRTC communications:

Protocol: Confidential WebRTC Media and Data

Identification Sequence: 0x63 0x2d 0x77 0x65 0x62 0x72 0x74 0x63 ("c-webrtc")

Specification: This document (RFCXXXX)

6. References

6.1. Normative References

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6.3. URIs

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