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Structured Connection ID Carrying Metadata

Abstract

This document describes a mechanism to carry the metadata in the QUIC connection ID so that the intermediary can perform optimization.

Status of This Memo

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1. Introduction

Nowadays, the media application are usually able to dynamically adjust the size and quality of the stream to adapt to the fluctuating network conditions. However, for the high throughput and low latency media traffic, adaptation only by the endpoint is not good enough, especially when the network condition is challenging, such as the wireless networks discussed in [I-D.kaippallimalil-tsvwg-media-hdr-wireless] and [I-D.defoy-moq-relay-network-handling]. To this end, it is desirable to have the intermediary performing optimization for the endpoint. For example, low priority packets can be dropped to save the resource when network is congested.

One example of such an intermediary is the relay in the Media over QUIC working group. To quote the charter from the MoQ working group. "Media over QUIC (moq) will develop a simple low-latency media delivery solution for ingest and distribution of media. This solution addresses use cases including live streaming, gaming, and media conferencing and will scale efficiently." "Even when media content is end-to-end encrypted, the relays can access metadata needed for caching (such as timestamp), making media forwarding decisions (such as drop or delay under congestion), and so on."

Due to the end-to-end encryption of the QUIC, the intermediary does not have the necessary metadata to perform optimization. Similar problem exists when the media is encrypted and transferred using SRTP [RFC3711]. To solve the problem, [I-D.ietf-avtext-framemarking] defines an extension of the RTP header containing the video frame information. This document defines an extension of QUIC header, using the connection ID to carry the necessary metadata. To mitigate the linkability between the multiple connection IDs of the same connection and protect the privacy, the metadata **MAY** be encrypted and only decrypted by authenticated intermediary. Similar to [I-D.ietf-quic-load-balancers], a configuration agent is used to

distribute the encryption parameters and the template of the metadata.

2. Terminology

This document uses terms in the [I-D.ietf-quic-load-balancers]:

* "client" and "server" refer to the QUIC endpoint.

* Intermediary refers to a network element which forwards QUIC packets and does not possess the QUIC connection keys. Such an intermediary can be QUIC proxy defined in the MASQUE working group, wireless node described in the [I-D.kaippallimalil-tsvwg-media-hdr-wireless] and relay defined in the Media over QUIC working group.

* CID: Connection ID in the QUIC header.

* Configuration agent: An entity that distributes the encryption parameter and the template of the metadata field.

All wire formats will be depicted using the notation defined in Section 1.3 of [RFC9000].

2.1. 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. Architecture

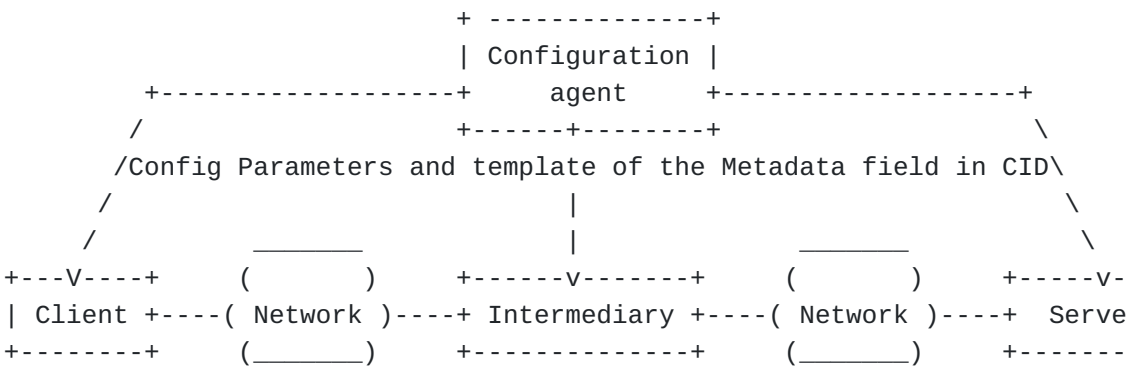

Figure 1: Architecture of the intermediary

Figure 1 shows the architecture of the optimization intermediary. The sender endpoint encode the metadata into the connection ID field (See Section 4). The intermediary performs the related optimization based on the metadata. Since different applications may need to expose different metadata to the intermediary, a template is used to define the content and the format of metadata. The template is determined and distributed by a configuration agent. If the network between the intermediary and endpoints is not trusted by endpoints, the metadata **MAY** be encrypted. In this case, the parameter for encryption **MUST** be shared only to the authenticated intermediary through the configuration agent. The means of the authentication and the distribution of these parameters and template is not in the scope of this document.

4. Structured Connection ID

```
Structured Connection ID {
  Config Parameters (8),
  Metadata (40...152),
}
```

Figure 2: Format of structured CID

The format of the structured connection ID is shown in Figure 2. The content and the format of the metadata field is defined by a template and shared between an endpoint and the intermediary. For example, the media frame information in Section 3.1 of [I-D.ietf-avtext-framemarking] and the service requirement such as delay and importance in Section 5 of [I-D.kaippallimalil-tsvwg-media-hdr-wireless-01] can be used as a template.

If an intermediary acts as both the load balancer and the optimization point and they share the same trust relationship, the Metadata and the Server ID defined in [I-D.ietf-quic-load-balancers] can be put together and share the same Config Parameter. Otherwise, if a QUIC connection goes through both load balancer and optimization point, additional mechanism is needed for the coexist of the metadata and the Server ID. The detail will be worked out in the later version.

5. Security Considerations

TBD

6. References

6.1. Normative References

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6.2. Informative References

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[I-D.kaippallimalil-tsvwg-media-hdr-wireless-01]
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