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FEC Grouping Semantics in SDP

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Abstract

This document defines the semantics that allows for grouping of forward error correction (FEC) streams with the protected payload streams in Session Description Protocol (SDP). The semantics defined in this document is to be used with Grouping of Media Lines in the Session Description Protocol (RFC 3388) to group together "m" lines in the same session.

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1. Introduction

The media lines in an SDP [3] session are usually associated with each other. SDP itself does not provide methods to convey the relationships between the media lines. Such relationships are indicated the extension to SDP as defined in Grouping of Media Lines in the Session Description Protocol (RFC 3388) [2]. RFC 3388 defines two types of semantics: Lip Synchronization, and Flow Identification.

Forward Error Correction (FEC) is a common technique to achieve robust communication in error-prone environments. In this document, we define the semantics that allows for grouping of FEC streams with the protected payload streams in SDP by further extending RFC 3388.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD, "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [1].

3. Forward Error Correction (FEC)

Forward Error Correction (FEC) is a common technique to achieve robust communication in error-prone environments. In FEC, communication uses a bandwidth that is more than payload to send redundantly coded payload information. The receivers can readily recover the original payload even when some communication is lost in the transmission. Compare to other error correction technique (such

as re-transmission), FEC can achieve much lower transmission delay,

and does not have the problem of implosion from retransmission requests in various multicast scenarios.

In general, the FEC data can be send in two different ways: (1) multiplexed together with the original payload stream, or (2) as a separate stream. It is thus necessary to define mechanisms to indicate the association relationship between the FEC data and the payload data they protect.

When FEC data are multiplexed with the original payload stream, the association relationship is indicated as specified in RTP Payload for Redundant Audio Data (RFC 2198) [4]. As an example, such relationship can be indicated as in the generic RFC payload format for FEC [5].

When FEC data are sent as a separate stream from the payload data, the association relationship can be indicated in various ways. This document on the FEC media line grouping specifies a mechanism for indicating such relationships.

4. FEC Grouping

4.1. FEC Group

Each "a=group" line are used to indicate the association relationship between the FEC streams and the payload stream. The streams included in one "a=group" line are called a "FEC Group".

Each FEC group MAY have one or more than one FEC streams, and one or more than one payload streams. For example, it is possible to have one payload streams protected by more than one FEC streams, or multiple payload streams sharing one FEC stream.

Grouping streams in a FEC group only indicates the association relationship between streams. The detailed FEC protection scheme/parameters are conveyed through the mechanism of the particular FEC algorithm used. For example, the FEC grouping is used for generic RTP payload for FEC (RFC YYYY) [5] to indicate the association relationship between the FEC stream and the payload stream. The detailed protection level and length information for the ULP algorithm is communicated in band within the FEC stream.

4.2. FEC Grouping Semantics

The FEC semantics is defined by the following BNF:

```
Semantics        = "FEC"
```

4.3. Offer / Answer Consideration

The backward compatibility in offer / answer is generally handled as specified in RFC 3388 [2].

Depending on the implementation, a node that does not understand FEC grouping (either does not understand line grouping at all, or just does not understand the FEC semantics) might respond to an offer containing FEC grouping either (1) with an answer which ignores the grouping attribute, or (2) with a refusal to the request (e.g., 488 Not acceptable here or 606 Not Acceptable).

In the first case, the original sender of the offer MUST establish the connection without FEC. In the second case, if the sender of the offer still wishes to establish the session, it SHOULD re-try the request with an offer without FEC.

4.4. Example of FEC Grouping

The following example shows a session description of a multicast conference. The first media stream (mid:1) contains the audio stream. The second media stream (mid:2) contains the Generic FEC [5] protection for the audio stream. These two streams form an FEC Group. The relationship between the two streams is indicated by the "a=group:FEC 1 2" line. The FEC stream is sent to the same multicast group and has the same TTL as the audio, but on a port number two higher. Likewise, the video stream (mid:3) and its Generic FEC protection stream (mid:4) forms another FEC group. The relationship between the two streams is indicated by the "a=group:FEC 3 4" line. The FEC stream is sent to a different multicast address, but has the same port number (30004) as the payload video stream.

```
v=0
o=adam 289083124 289083124 IN IP4 host.example.com
s=ULP FEC Seminar
t=0 0
c=IN IP4 224.2.17.12/127
a=group:FEC 1 2
a=group:FEC 3 4
m=audio 30000 RTP/AVP 0
a=mid:1
m=application 30002 RTP/AVP 100
a=rtpmap:100 ulpfec/8000
a=mid:2
m=video 30004 RTP/AVP 31
a=mid:3
m=application 30004 RTP/AVP 101
c=IN IP4 224.2.17.13/127
a=rtpmap:101 ulpfec/8000
a=mid:4
```

5. Security Consideration

There is a weak threat for the receiver that the FEC grouping can be modified to indicate FEC relationships that do not exist. Such attacks may result in failure of FEC protect, and/or mishandling of other media payload streams. It is recommended that the receiver implementation SHOULD do integrity check to thwart such threats.

6. IANA Considerations

This document defines the semantics to be used with grouping of media lines in SDP as defined in RFC 3388. The semantics defined in this document are to be registered by the IANA when they are published in standard track RFCs.

The following semantics need to be registered with IANA.

Semantics	Token	Reference
Forward Error Correction	FEC	RFC XXXX

7. Acknowledgments

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9. References

9.1. Normative References

[1] S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119, March 1997.
[2] G. Camarillo, J. Holler, and H. Schulzrinne, "Grouping of Media Lines in the Session Description Protocol (SDP)", RFC 3388, December 2002.

9.2. Informative References

[3] M. Handley, and V. Jacobson, "SDP: Session Description Protocol", RFC 2327, April 1998.
[4] C. Perkins, I. Kouvelas, O. Hodson, V. Hardman, M. Handley, J.C. Bolot, A. Vega-Garcia, and S. Fosse-Parisis, "RTP Payload for Redundant Audio Data", RFC 2198, September 1997.
[5] A. Li, "An RFC Payload Format for Generic FEC", IETF work in progress.

Copyright Statement

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RFC Editor Considerations

The RFC-editor is kindly requested to perform the following modifications upon the publication of this specification:

- Replace all occurrences of RFC XXXX with the RFC number this specification receives when being published.

- Replace reference [5] and all occurrences of RFC YYYY with the corresponding title and RFC number of that ID when it is published.

- Remove this Section.

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