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Internet-Draft	Qualcomm Inc.
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RTP Payload Format for Raptor FEC
draft-ietf-fecframe-rtp-raptor-01

Status of this Memo

Copyright Notice

Abstract

This document specifies an RTP Payload Format for Forward Error Correction repair data produced by the Raptor FEC Schemes. Raptor FEC Schemes are specified for use with the IETF FEC Framework which supports transport of repair data over both UDP and RTP. This document specifies the Payload Format which is required for the use of RTP to carry Raptor repair flows.

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1. Introduction

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The FEC Framework [I-D.ietf-fecframe-framework] (Watson, M., “Forward Error Correction (FEC) Framework,” March 2010.) defines a general framework for the use of Forward Error Correction in association with arbitrary packet flows, including flows over UDP and RTP. Forward Error Corrections operates by generating redundant data packets ("repair data") which can be sent independently from the original flow. At a receiver the original flow can be reconstructed provided a sufficient set of redundant data packets and possibly original data packets are received.

The FEC Framework provides for independence between application protocols and FEC codes. The use of a particular FEC code within the framework is defined by means of an FEC Scheme which may then be used with any application protocol compliant to the framework.

Repair data flows may be sent directly over a transport protocol such as UDP, or they may be encapsulated within RTP. In the latter case, an RTP Payload Format must be defined for each FEC Scheme.

This document defines the RTP Payload Format for the Raptor FEC Schemes defined in [I-D.ietf-fecframe-raptor] (Watson, M., “Raptor FEC Schemes for FECFRAME,” March 2010.).

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2. Conventions, Definitions and Acronyms

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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 [RFC2119] (Bradner, S., “Key words for use in RFCs to Indicate Requirement Levels,” March 1997.).

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3. Media Format Background

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The Raptor code is an efficient XOR-based block-based fountain code, meaning that from any group of source packets (or 'source block') an arbitrary number of repair packets may be generated. The Raptor code has the property that the original group of source packets can be recovered with very high probability from any set of packets (source and repair) only slightly greater in number than the original number of source packets.
[I-D.ietf-fecframe-raptor] (Watson, M., “Raptor FEC Schemes for FECFRAME,” March 2010.) defines three FEC Schemes for the use of the Raptor code with arbitary packet flows: the first scheme is fully applicable to arbitary packet flows. The second scheme is a slightly optimised version of the first scheme which is applicable in applications with relatively small block sizes. The third scheme is a variant of the second scheme which is applicable to a single source flow which already has some kind of identifiable sequence number. The presence of a sequence number in the source flow allows for backwards compatible operation (the source flows do not need to be modified in order to apply FEC). In this case, in the language of the FEC Framework, there is no explicit FEC Source Payload Id.

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4. Payload Format

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The RTP Payload contains a FEC Repair Payload as defined in [I-D.ietf-fecframe-raptor] (Watson, M., “Raptor FEC Schemes for FECFRAME,” March 2010.).

4.1. RTP Header Usage

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The rules SHALL be followed for the RTP header used with FEC repair packets:

*Marker bit: The marker bit shall be set 1 for the last protection RTP packet sent for each source block, and otherwise set to 0

*Timestamp: The timestamp SHALL be set to a time corresponding to the packet's transmission time. The timestamp value has no use in the actual FEC protection process. It may be used for packet arrival timing and jitter calculations.

4.2. Payload Header

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There is no Payload Header in this Payload Format

4.3. Payload Data

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The RTP Payload contains a FEC Repair Payload as defined in [I-D.ietf-fecframe-framework] (Watson, M., “Forward Error Correction (FEC) Framework,” March 2010.) and [I-D.ietf-fecframe-raptor] (Watson, M., “Raptor FEC Schemes for FECFRAME,” March 2010.).

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5. Congestion Control Considerations

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See [I-D.ietf-fecframe-framework] (Watson, M., “Forward Error Correction (FEC) Framework,” March 2010.).

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6. Media Types

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6.1. Registration of the application/raptorfec media type

This RTP payload format is identified using the application/raptorfec media type which is registered in accordance with [RFC4855] (Casner, S., "Media Type Registration of RTP Payload Formats," February 2007.) and using the template of [RFC4288] (Freed, N. and J. Klensin, "Media Type Specifications and Registration Procedures," December 2005.).

6.1.1. Media Type Definition

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Type name: application
Subtype name: raptorfec
Required parameters:

> raptor-scheme-id: The value of this parameter is the FEC Scheme Id for the specific Raptor FEC Scheme that will be used as defined in [I-D.ietf-fecframe-raptor] (Watson, M., "Raptor FEC Schemes for FECFRAME," March 2010.).
>
> max-sbl: The value of this parameter is the FEC Object Transmission Information element "Maximum Source Block Length" as defined in [I-D.ietf-fecframe-raptor] (Watson, M., "Raptor FEC Schemes for FECFRAME," March 2010.) encoded as a decimal integer.
>
> symbol-size: The value of this parameter is the FEC Object Transmission Information element "Encoding Symbol Size" as definedf in [I-D.ietf-fecframe-raptor] (Watson, M., "Raptor FEC Schemes for FECFRAME," March 2010.) encoded as a decimal integer.

Optional parameters: none
Encoding considerations: This media type is framed and binary, see section 4.8 in [RFC4288] (Freed, N. and J. Klensin, "Media Type Specifications and Registration Procedures," December 2005.)
Security considerations: Please see security consideration in [I-D.ietf-fecframe-framework] (Watson, M., "Forward Error Correction (FEC) Framework," March 2010.)
Interoperability considerations:
Published specification: [I-D.ietf-fecframe-raptor] (Watson, M., "Raptor FEC Schemes for FECFRAME," March 2010.)
Applications that use this media type:
Additional information:
Magic number(s): <none defined>
File extension(s): <none defined>
Macintosh file type code(s): <none defined>
Person & email address to contact for further information: Mark Watson, watson@qualcomm.com
Intended usage: COMMON

Restrictions on usage: This media type depends on RTP framing, and hence is only defined for transfer via RTP [[RFC3550] (Schulzrinne, H., Casner, S., Frederick, R., and V. Jacobson, "RTP: A Transport Protocol for Real-Time Applications," July 2003.)]. Transport within other framing protocols is not defined at this time.
Author: Mark Watson, Qualcomm Inc.
Change controller: IETF Audio/Video Transport working group delegated from the IESG.

6.2. Registration of the video/raptorfec media type

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This RTP payload format is identified using the video/raptorfec media type which is registered in accordance with [RFC4855] (Casner, S., "Media Type Registration of RTP Payload Formats," February 2007.) and using the template of [RFC4288] (Freed, N. and J. Klensin, "Media Type Specifications and Registration Procedures," December 2005.).

6.2.1. Media Type Definition

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Type name: video
Subtype name: raptorfec
Required parameters:

> raptor-scheme-id: The value of this parameter is the FEC Scheme Id for the specific Raptor FEC Scheme that will be used as defined in [I-D.ietf-fecframe-raptor] (Watson, M., "Raptor FEC Schemes for FECFRAME," March 2010.)
>
> max-sbl: The value of this parameter is the FEC Object Transmission Information element "Maximum Source Block Length" as defined in [I-D.ietf-fecframe-raptor] (Watson, M., "Raptor FEC Schemes for FECFRAME," March 2010.) encoded as a decimal integer.
>
> symbol-size: The value of this parameter is the FEC Object Transmission Information element "Encoding Symbol Size" as definedf in [I-D.ietf-fecframe-raptor] (Watson, M., "Raptor FEC Schemes for FECFRAME," March 2010.) encoded as a decimal integer.

Optional parameters: none
Encoding considerations: This media type is framed and binary, see section 4.8 in [RFC4288] (Freed, N. and J. Klensin, "Media Type Specifications and Registration Procedures," December 2005.)

Security considerations: Please see security consideration in [I-D.ietf-fecframe-framework] (Watson, M., “Forward Error Correction (FEC) Framework,” March 2010.)
Interoperability considerations:
Published specification: [I-D.ietf-fecframe-raptor] (Watson, M., “Raptor FEC Schemes for FECFRAME,” March 2010.)
Applications that use this media type:
Additional information:
Magic number(s): <none defined>
File extension(s): <none defined>
Macintosh file type code(s): <none defined>
Person & email address to contact for further information: Mark Watson, watson@qualcomm.com
Intended usage: COMMON
Restrictions on usage: This media type depends on RTP framing, and hence is only defined for transfer via RTP [[RFC3550] (Schulzrinne, H., Casner, S., Frederick, R., and V. Jacobson, “RTP: A Transport Protocol for Real-Time Applications,” July 2003.)]. Transport within other framing protocols is not defined at this time.
Author: Mark Watson, Qualcomm Inc.
Change controller: IETF Audio/Video Transport working group delegated from the IESG.

6.3. Registration of the audio/raptorfec media type

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This RTP payload format is identified using the audio/raptorfec media type which is registered in accordance with [RFC4855] (Casner, S., “Media Type Registration of RTP Payload Formats,” February 2007.) and using the template of [RFC4288] (Freed, N. and J. Klensin, “Media Type Specifications and Registration Procedures,” December 2005.).

6.3.1. Media Type Definition

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Type name: audio
Subtype name: raptorfec
Required parameters:

> raptor-scheme-id: The value of this parameter is the FEC Scheme Id for the specific Raptor FEC Scheme that will be used as defined in [I-D.ietf-fecframe-raptor] (Watson, M., “Raptor FEC Schemes for FECFRAME,” March 2010.)
>
> max-sbl: The value of this parameter is the FEC Object Transmission Information element "Maximum Source Block Length" as defined in

> [I-D.ietf-fecframe-raptor] (Watson, M., "Raptor FEC Schemes for FECFRAME," March 2010.) encoded as a decimal integer.
>
> symbol-size: The value of this parameter is the FEC Object Transmission Information element "Encoding Symbol Size" as definedf in [I-D.ietf-fecframe-raptor] (Watson, M., "Raptor FEC Schemes for FECFRAME," March 2010.) encoded as a decimal integer.

Optional parameters: none
Encoding considerations: This media type is framed and binary, see section 4.8 in [RFC4288] (Freed, N. and J. Klensin, "Media Type Specifications and Registration Procedures," December 2005.)
Security considerations: Please see security consideration in [I-D.ietf-fecframe-framework] (Watson, M., "Forward Error Correction (FEC) Framework," March 2010.)
Interoperability considerations:
Published specification: [I-D.ietf-fecframe-raptor] (Watson, M., "Raptor FEC Schemes for FECFRAME," March 2010.)
Applications that use this media type:
Additional information:
Magic number(s): <none defined>
File extension(s): <none defined>
Macintosh file type code(s): <none defined>
Person & email address to contact for further information: Mark Watson, watson@qualcomm.com
Intended usage: COMMON
Restrictions on usage: This media type depends on RTP framing, and hence is only defined for transfer via RTP [[RFC3550] (Schulzrinne, H., Casner, S., Frederick, R., and V. Jacobson, "RTP: A Transport Protocol for Real-Time Applications," July 2003.)]. Transport within other framing protocols is not defined at this time.
Author: Mark Watson, Qualcomm Inc.
Change controller: IETF Audio/Video Transport working group delegated from the IESG.

6.4. Registration of the text/raptorfec media type

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This RTP payload format is identified using the text/raptorfec media type which is registered in accordance with [RFC4855] (Casner, S., "Media Type Registration of RTP Payload Formats," February 2007.) and using the template of [RFC4288] (Freed, N. and J. Klensin, "Media Type Specifications and Registration Procedures," December 2005.).

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6.4.1. Media Type Definition

Type name: text
Subtype name: raptorfec
Required parameters:

> raptor-scheme-id: The value of this parameter is the FEC Scheme Id for the specific Raptor FEC Scheme that will be used as defined in [I-D.ietf-fecframe-raptor] (Watson, M., “Raptor FEC Schemes for FECFRAME,” March 2010.)
>
> max-sbl: The value of this parameter is the FEC Object Transmission Information element "Maximum Source Block Length" as defined in [I-D.ietf-fecframe-raptor] (Watson, M., “Raptor FEC Schemes for FECFRAME,” March 2010.) encoded as a decimal integer.
>
> symbol-size: The value of this parameter is the FEC Object Transmission Information element "Encoding Symbol Size" as definedf in [I-D.ietf-fecframe-raptor] (Watson, M., “Raptor FEC Schemes for FECFRAME,” March 2010.) encoded as a decimal integer.

Optional parameters: none
Encoding considerations: This media type is framed and binary, see section 4.8 in [RFC4288] (Freed, N. and J. Klensin, “Media Type Specifications and Registration Procedures,” December 2005.)
Security considerations: Please see security consideration in [I-D.ietf-fecframe-framework] (Watson, M., “Forward Error Correction (FEC) Framework,” March 2010.)
Interoperability considerations:
Published specification: [I-D.ietf-fecframe-raptor] (Watson, M., “Raptor FEC Schemes for FECFRAME,” March 2010.)
Applications that use this media type:
Additional information:
Magic number(s): <none defined>
File extension(s): <none defined>
Macintosh file type code(s): <none defined>
Person & email address to contact for further information: Mark Watson, watson@qualcomm.com
Intended usage: COMMON
Restrictions on usage: This media type depends on RTP framing, and hence is only defined for transfer via RTP [[RFC3550] (Schulzrinne, H., Casner, S., Frederick, R., and V. Jacobson, “RTP: A Transport Protocol for Real-Time Applications,” July 2003.)]. Transport within other framing protocols is not defined at this time.
Author: Mark Watson, Qualcomm Inc.
Change controller: IETF Audio/Video Transport working group delegated from the IESG.

7. Mapping to SDP

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The mapping of the above defined payload format media type and its parameters SHALL be done according to Section 3 of [RFC4855] (Casner, S., “Media Type Registration of RTP Payload Formats,” February 2007.) When the RTP Payload Formats defined in this document are used, the Media Type Parameters defined above SHALL be used to specify the FEC Object Transmission Information in preference to the SDP attributes specified in [I-D.ietf-fecframe-sdp-elements] (Begen, A., “SDP Elements for FEC Framework,” April 2010.)

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8. Offer/Answer considerations

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None.

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9. Declarative SDP Considerations

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None.

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10. IANA Considerations

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This memo requests that IANA registers application/raptorfec as specified in Section 6.1.1 (Media Type Definition), video/raptorfec as specified in Section 6.2.1 (Media Type Definition), audio/raptorfec as specified in Section 6.3.1 (Media Type Definition) and text/raptorfec as specified in Section 6.4.1 (Media Type Definition). The media type is also requested to be added to the IANA registry for "RTP Payload Format MIME types" (http://www.iana.org/assignments/rtp-parameters).

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11. Security Considerations

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See [I-D.ietf-fecframe-framework] (Watson, M., “Forward Error Correction (FEC) Framework,” March 2010.)

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12. References

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[RFC2119]	Bradner, S., “Key words for use in RFCs to Indicate Requirement Levels,” BCP 14, RFC 2119, March 1997 (TXT, HTML, XML).
[RFC3550]	Schulzrinne, H., Casner, S., Frederick, R., and V. Jacobson, “RTP: A Transport Protocol for Real-Time Applications,” STD 64, RFC 3550, July 2003 (TXT, PS, PDF).
[RFC4288]	Freed, N. and J. Klensin, “Media Type Specifications and Registration Procedures,” BCP 13, RFC 4288, December 2005 (TXT).
[RFC4855]	Casner, S., “Media Type Registration of RTP Payload Formats,” RFC 4855, February 2007 (TXT).
[I-D.ietf-fecframe-framework]	Watson, M., “Forward Error Correction (FEC) Framework,” draft-ietf-fecframe-framework-07 (work in progress), March 2010 (TXT).
[I-D.ietf-fecframe-sdp-elements]	Begen, A., “SDP Elements for FEC Framework,” draft-ietf-fecframe-sdp-elements-06 (work in progress), April 2010 (TXT).
[I-D.ietf-fecframe-raptor]	Watson, M., “Raptor FEC Schemes for FECFRAME,” draft-ietf-fecframe-raptor-02 (work in progress), March 2010 (TXT).

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