

AVTCORE WG M.  
Westerlund  
Internet-Draft  
Ericsson  
Updates: [3550](#), [3551](#) (if approved) C.  
Perkins  
Intended status: Standards Track University of  
Glasgow  
Expires: September 10, 2015 J.  
Lennox

Vidyo

March 9,

2015

## **Sending Multiple Types of Media in a Single RTP Session draft-ietf-avtcore-multi-media-rtsp-session-07**

### Abstract

This document specifies how an RTP session can contain RTP Streams with media from multiple media types such as audio, video, and text. This has been restricted by the RTP Specification, and thus this document updates [RFC 3550](#) and [RFC 3551](#) to enable this behaviour for applications that satisfy the applicability for using multiple media types in a single RTP session.

### Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on September 10, 2015.

### Copyright Notice

Copyright (c) 2015 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with

respect

Westerlund, et al.  
1]

Expires September 10, 2015

[Page

to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Table of Contents

1. Introduction . . . . . 2
2. Definitions . . . . . 3
3. Motivation . . . . . 4
4. Overview of Solution . . . . . 5
5. Applicability . . . . . 5
5.1. Usage of the RTP session . . . . . 6
5.2. Signalled Support . . . . . 6
5.3. Homogeneous Multi-party . . . . . 7
5.4. Reduced number of Payload Types . . . . . 8
5.5. Stream Differentiation . . . . . 8
5.6. Non-compatible Extensions . . . . . 8
6. RTP Session Specification . . . . . 9
6.1. RTP Session . . . . . 9
6.2. Sender Source Restrictions . . . . . 11
6.3. Payload Type Applicability . . . . . 12
6.4. RTCP Considerations . . . . . 12
7. Extension Considerations . . . . . 12
7.1. RTP Retransmission . . . . . 13
7.2. Generic FEC . . . . . 14
8. Signalling . . . . . 15
8.1. SDP-Based Signalling . . . . . 16
9. IANA Considerations . . . . . 16
10. Security Considerations . . . . .

[16](#)  
[11](#). Acknowledgements . . . . .  
[16](#)  
[12](#). References . . . . .  
[16](#)  
    [12.1](#). Normative References . . . . .  
[16](#)  
    [12.2](#). Informative References . . . . .  
[17](#)  
Authors' Addresses . . . . .  
[18](#)

**[1](#). Introduction**

When the Real-time Transport Protocol (RTP) [[RFC3550](#)] was designed, close to 20 years ago, IP networks were different to those deployed at the time of this writing. The virtually ubiquitous deployment of Network Address Translators (NAT) and Firewalls has since increased the cost and likely-hood of communication failure when using many different transport flows. Hence, there is pressure to reduce the number of concurrent transport flows used by RTP applications.

The RTP specification recommends against sending several different types of media, for example audio and video, in a single RTP session.

The RTP profile for Audio and Video Conferences with Minimal Control (RTP/AVP) [[RFC3551](#)] mandates a similar restriction. The motivation for these limitations is partly to allow lower layer Quality of Service (QoS) mechanisms to be used, and partly due to limitations of the RTCP timing rules that assumes all media in a session to have similar bandwidth. The Session Description Protocol (SDP) [[RFC4566](#)] is one of the dominant signalling methods for establishing RTP sessions, and has enforced this rule by not allowing multiple media types for a given destination or set of ICE candidates.

The fact that these limitations have been in place for so long, in addition to [RFC 3550](#) being written without fully considering the use of multiple media types in an RTP session, results in a number of issues when allowing this behaviour. This memo updates [[RFC3550](#)] and [[RFC3551](#)] with important considerations regarding applicability and functionality when using multiple types of media in an RTP session, including normative specification of behaviour. This memo makes no changes to RTP behaviour when using multiple RTP streams with media of the same type (e.g., multiple audio streams or multiple video streams) in a single RTP session. Instead it relies on the clarifications in [[I-D.ietf-avtcore-rtp-multi-stream](#)].

This memo is structured as follows. First, some basic definitions are provided. This is followed by a background that discusses the motivation in more detail. A overview of the solution of how to provide multiple media types in one RTP session is then presented. Next is the formal applicability this specification have followed by the normative specification. This is followed by a discussion how some RTP/RTCP Extensions are expected to function in the case of multiple media types in one RTP session. A specification of the requirements on signalling from this specification and a look how this is realized in SDP using Bundle [[I-D.ietf-mmusic-sdp-bundle-negotiation](#)]. The memo ends with the security considerations.

## **2. Definitions**

**Media Type:** The general type of media data used by a real-time application. The media type corresponds to the value used in the <media> field of an SDP m= line. The media types defined at the time of this writing are "audio", "video", "text", "application", and "message".

**Quality of Service (QoS):** Network mechanisms that are intended to ensure that the packets within a flow or with a specific marking are transported with certain properties.



The terms Encoded Stream, Endpoint, Media Source, RTP Session, and RTP Stream are used as defined in [\[I-D.ietf-avtext-rtp-grouping-taxonomy\]](#).

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 [\[RFC2119\]](#).

### **3. Motivation**

The existence of NATs and Firewalls at almost all Internet access has

had implications on protocols like RTP that were designed to use multiple transport flows. First of all, the NAT/FW traversal solution needs to ensure that all these transport flows are established. This has three consequences:

1. Increased delay to perform the transport flow establishment
2. The more transport flows, the more state and the more resource consumption in the NAT and Firewalls. When the resource consumption in NAT/FWs reaches their limits, unexpected behaviours usually occur.
3. More transport flows means a higher risk that some transport flow fails to be established, thus preventing the application to communicate.

Using fewer transport flows reduces the risk of communication failure, improved establishment behaviour and less load on NAT and Firewalls.

Furthermore, we note that many RTP-using applications don't utilize any network level Quality of Service (QoS) functions. Nor do they expect or desire any separation in network treatment of its media packets, independent of whether they are audio, video or text. When an application has no such desire, it doesn't need to provide a transport flow structure that simplifies flow based QoS.

For applications that don't require different lower-layer QoS for different media types, and that have no special requirements for RTP extensions or RTCP reporting, the requirement to separate different media into different RTP sessions might seem unnecessary. Provided the application accepts that all media flows will get similar RTCP reporting, using the same RTP session for several types of media at once appears a reasonable choice. The architecture ought to be agnostic about the type of media being carried in an RTP session to the extent possible given the constraints of the protocol.





#### **4. Overview of Solution**

The goal of the solution is to enable each RTP session to contain more than just one media type. This includes having multiple RTP sessions containing a given media type, for example having three sessions containing both video and audio.

The solution is quite straightforward. The first step is to override

the SHOULD and SHOULD NOT language of the RTP specification [RFC3550]. Similar change is needed to a sentence in [Section 6 of RFC3551](#) that states that "different media types SHALL NOT be interleaved or multiplexed within a single RTP Session". This is resolved by appropriate exception clauses given that this specification and its applicability is followed.

Within an RTP session where multiple media types have been configured

for use, an SSRC can only send one type of media during its lifetime (i.e., it can switch between different audio codecs, since those are both the same type of media, but cannot switch between audio and video). Different SSRCs MUST be used for the different media sources, the same way multiple media sources of the same media type already have to do. The payload type will inform a receiver which media type the SSRC is being used for. Thus the payload type MUST

be

unique across all of the payload configurations independent of media type that is used in the RTP session.

Some few extra considerations within the RTP sessions also needs to be considered. RTCP bandwidth and regular reporting suppression (RTP/AVPF and RTP/SAVPF) SHOULD be configured to reduce the impact for bit-rate variations between RTP streams and media types. It is also clarified how timeout calculations are to be done to avoid any issues. Certain payload types like FEC also need additional rules.

The final important part of the solution to this is to use signalling

and ensure that agreement on using multiple media types in an RTP session exists, and how that then is configured. This memo describes

some existing requirements, while an external reference defines how this is accomplished in SDP.

#### **5. Applicability**

This specification has limited applicability, and anyone intending to

use it needs to ensure that their application and usage meets the below criteria.



### **5.1. Usage of the RTP session**

Before choosing to use this specification, an application implementer needs to ensure that they don't have a need for different RTP sessions between the media types for some reason. The main rule is that if one expects to have equal treatment of all media packets, then this specification might be suitable. The equal treatment include anything from network level up to RTCP reporting and feedback. The document Guidelines for using the Multiplexing Features of RTP [[I-D.ietf-avtcore-multiplex-guidelines](#)] gives more detailed guidance on aspects to consider when choosing how to use RTP and specifically sessions.

There is some work in progress [[I-D.westerlund-avtcore-transport-multiplexing](#)] that attempt to address a solution for RTP-using applications that need or would prefer multiple RTP sessions, but do not require the functionalities or behaviours that multiple transport flows give.

The second important consideration is the resulting behaviour when media flows to be sent within a single RTP session does not have similar RTCP requirements. There are limitations in the RTCP timing rules, and this implies a common RTCP reporting interval across all participants in a session. If an RTP session contains flows with very different RTCP requirements, for example due to RTP Streams bandwidth consumption and packet rate, for example low-rate audio coupled with high-quality video, this can result in either excessive or insufficient RTCP for some flows, depending how the RTCP session bandwidth, and hence reporting interval, is configured. This is discussed further in [Section 6.4](#).

### **5.2. Signalled Support**

Usage of this specification is not compatible with anyone following [RFC 3550](#) and intending to have different RTP sessions for each media type. Therefore there needs to be mutual agreement to use multiple media types in one RTP session by all participants within that RTP session. This agreement has to be determined using signalling in most cases.

This requirement can be a problem for signalling solutions that can't negotiate with all participants. For declarative signalling solutions, mandating that the session is using multiple media types in one RTP session can be a way of attempting to ensure that all participants in the RTP session follow the requirement. However, for signalling solutions that lack methods for enforcing that a receiver supports a specific feature, this can still cause issues.



### **5.3. Homogeneous Multi-party**

In multiparty communication scenarios it is important to separate two different cases. One case is where the RTP session contains multiple participants in a common RTP session. This occurs for example in Any Source Multicast (ASM) and Relay (Transport Translator) topologies as defined in RTP Topologies [[I-D.ietf-avtcore-rtp-topologies-update](#)]. It can also occur in some implementations of RTP mixers that share the same SSRC/CSRC space across all participants. The second case is when the RTP session is terminated in a middlebox and the other participants sources are projected or switched into each RTP session and rewritten on RTP header level including SSRC mappings.

For the first case, with a common RTP session or at least shared SSRC/CSRC values, all participants in multiparty communication are REQUIRED to support multiple media types in an RTP session. An participant using two or more RTP sessions towards a multiparty session can't be collapsed into a single session with multiple media types. The reason is that in case of multiple RTP sessions, the same

SSRC value can be use in both RTP sessions without any issues, but when collapsed to a single session there is an SSRC collision. In addition some collisions can't be represented in the multiple separate RTP sessions. For example, in a session with audio and video, an SSRC value used for video will not show up in the Audio RTP session at the participant using multiple RTP sessions, and thus not trigger any collision handling. Thus any application using this type

of RTP session structure MUST have a homogeneous support for multiple media types in one RTP session, or be forced to insert a translator node between that participant and the rest of the RTP session.

For the second case of separate RTP sessions for each multiparty participant and a central node it is possible to have a mix of single

RTP session users and multiple RTP session users as long as one is willing to remap the SSRCs used by a participant with multiple RTP sessions into non-used values in the single RTP session SSRC space for each of the participants using a single RTP session with multiple

media types. It can be noted that this type of implementation has to understand all types of RTP/RTCP extension being used in the RTP sessions to correctly be able to translate them between the RTP sessions. It might also suffer issues due to differences in

configured RTCP bandwidth and other parameters between the RTP sessions. It can also negatively impact the possibility for loop detection, as SSRC/CSRC can't be used to detect the loops, instead some other RTP stream or media source identity name space that is common across all interconnect parts are needed.

#### **5.4. Reduced number of Payload Types**

An RTP session with multiple media types in it have only a single 7-bit Payload Type range for all its payload types. Within the 128 available values, only 96 or less if "Multiplexing RTP Data and Control Packets on a Single Port" [[RFC5761](#)] is used, all the different RTP payload configurations for all the media types need to fit in the available space. For most applications this will not be

a real problem, but the limitation exists and could be encountered.

#### **5.5. Stream Differentiation**

If network level differentiation of the RTP streams with different media types is desired, using this specification can cause severe limitations. All RTP streams in an RTP session, independent of the media type, will be sent over the same underlying transport flow. Any flow-based Quality of Service (QoS) mechanism will be unable to provide differentiated treatment between different media types, e.g. to prioritize audio over video. If differentiated treatment is desired using flow-based QoS, separate RTP sessions over different underlying transport flows needs to be used.

Marking-based QoS schemes like DiffServ can be affected if a network ingress is the one that performs, markings based on flows. Endpoint marking where the network API supports marking on individual packet level will be unaffected by this specification. However, there exist

limitations, as discussed in [[I-D.ietf-dart-dscp-rtp](#)], on how different traffic classes can be applied on different packets or RTP streams within a single transport flow.

#### **5.6. Non-compatible Extensions**

There exist some RTP and RTCP extensions that rely on the existence of multiple RTP sessions. If the goal of using an RTP session with multiple media types is to have only a single RTP session, then these

extensions can't be used. If one has no need to have different RTP sessions for the media types but is willing to have multiple RTP sessions, one for the main media transmission and one for the extension, they can be used. It is to be noted that this assumes that it is possible to get the extension working when the related

RTP session contains multiple media types.

Identified RTP/RTCP extensions that require multiple RTP Sessions are:

RTP Retransmission: RTP Retransmission [[RFC4588](#)] has a session multiplexed mode. It also has a SSRC multiplexed mode that can

be





used instead. So use the mode that is suitable for the RTP application.

XOR-Based FEC: The RTP Payload Format for Generic Forward Error Correction [[RFC5109](#)] and its predecessor [[RFC2733](#)] requires a separate RTP session unless the FEC data is carried in RTP Payload for Redundant Audio Data [[RFC2198](#)]. However, using the Generic FEC with the Redundancy payload has another set of restrictions, see [Section 7.2](#).

Note that the Source-Specific Media Attributes [[RFC5576](#)] specification defines an SDP syntax (the "FEC" semantic of the "ssrc-group" attribute) to signal FEC relationships between multiple RTP streams within a single RTP session. However, this can't be used as the FEC repair packets need to have the same SSRC value as the source packets being protected. [[RFC5576](#)] does not normatively update and resolve that restriction. There is ongoing work on an ULP extension to allow it be use FEC RTP streams within the same RTP Session as the source stream [[I-D.lennox-payload-ulp-ssrc-mux](#)].

## **6. RTP Session Specification**

This section defines what needs to be done or avoided to make an RTP session with multiple media types function without issues.

### **6.1. RTP Session**

[Section 5.2](#) of "RTP: A Transport Protocol for Real-Time Applications" [[RFC3550](#)] states:

For example, in a teleconference composed of audio and video media encoded separately, each medium SHOULD be carried in a separate RTP session with its own destination transport address.

Separate audio and video streams SHOULD NOT be carried in a single RTP session and demultiplexed based on the payload type or SSRC fields.

This specification changes both of these sentences. The first sentence is changed to:

For example, in a teleconference composed of audio and video media encoded separately, each medium SHOULD be carried in a separate

RTP session with its own destination transport address, unless specification [RFCXXXX] is followed and the application meets the applicability constraints.

The second sentence is changed to:

Separate audio and video media sources SHOULD NOT be carried in a single RTP session and demultiplexed based on the payload type or SSRC fields, unless multiplexed based on both SSRC and payload type and usage meets what Multiple Media Types in an RTP Session [RFCXXXX] specifies.

Second paragraph of [Section 6](#) in RTP Profile for Audio and Video Conferences with Minimal Control [[RFC3551](#)] says:

The payload types currently defined in this profile are assigned to exactly one of three categories or media types: audio only, video only and those combining audio and video. The media types are marked in Tables 4 and 5 as "A", "V" and "AV", respectively. Payload types of different media types SHALL NOT be interleaved

or

multiplexed within a single RTP session, but multiple RTP

sessions

MAY be used in parallel to send multiple media types. An RTP source MAY change payload types within the same media type during a session. See the section "Multiplexing RTP Sessions" of [RFC 3550](#) for additional explanation.

This specifications purpose is to violate that existing SHALL NOT under certain conditions. Thus also this sentence has to be changed to allow for multiple media type's payload types in the same session.

The above sentence is changed to:

Payload types of different media types SHALL NOT be interleaved

or

multiplexed within a single RTP session unless as specified and under the restriction in Multiple Media Types in an RTP Session [RFCXXXX]. Multiple RTP sessions MAY be used in parallel to send multiple media types.

RFC-Editor Note: Please replace RFCXXXX with the RFC number of this specification when assigned.

We can now go on and discuss the five bullets that are motivating the previous in [Section 5.2](#) of the RTP Specification [[RFC3550](#)]. They are repeated here for the reader's convenience:

1. If, say, two audio streams shared the same RTP session and the same SSRC value, and one were to change encodings and thus acquire a different RTP payload type, there would be no general way of identifying which stream had changed encodings.
2. An SSRC is defined to identify a single timing and sequence

number space. Interleaving multiple payload types would require different timing spaces if the media clock rates differ and would

Westerlund, et al.  
10]

Expires September 10, 2015

[Page

require different sequence number spaces to tell which payload type suffered packet loss.

3. The RTCP sender and receiver reports (see Section 6.4 of [RFC 3550](#)) can only describe one timing and sequence number space per SSRC and do not carry a payload type field.
4. An RTP mixer would not be able to combine interleaved streams of incompatible media into one stream.
5. Carrying multiple media in one RTP session precludes: the use of different network paths or network resource allocations if appropriate; reception of a subset of the media if desired, for example just audio if video would exceed the available bandwidth;  
and receiver implementations that use separate processes for the different media, whereas using separate RTP sessions permits either single- or multiple-process implementations.

Bullets 1 to 3 are all related to that each media source has to use one or more unique SSRCs to avoid these issues as mandated below ([Section 6.2](#)). Bullet 4 can be served by two arguments, first of all each SSRC will be associated with a specific media type, communicated through the RTP payload type, allowing a middlebox to do media type specific operations. The second argument is that in many contexts blind combining without additional contexts are anyway not suitable. Regarding bullet 5 this is a understood and explicitly stated applicability limitations for the method described in this document.

## **6.2. Sender Source Restrictions**

A SSRC in the RTP session MUST only send one media type (audio, video, text etc.) during the SSRC's lifetime. The main motivation is that a given SSRC has its own RTP timestamp and sequence number spaces. The same way that you can't send two encoded streams of audio on the same SSRC, you can't send one encoded audio and one encoded video stream on the same SSRC. Each encoded stream when made into an RTP stream needs to have the sole control over the sequence number and timestamp space. If not, one would not be able to detect packet loss for that particular encoded stream. Nor can one easily determine which clock rate a particular SSRCs timestamp will increase with. For additional arguments why RTP payload type based multiplexing of multiple media sources doesn't work see [[I-D.ietf-avtcore-multiplex-guidelines](#)].



### **6.3. Payload Type Applicability**

Most Payload Types have a native media type, like an audio codec is natural belonging to the audio media type. However, there exist a number of RTP payload types that don't have a native media type.

For

example, transport robustness mechanisms like RTP Retransmission [[RFC4588](#)] and Generic FEC [[RFC5109](#)] inherit their media type from what they protect. RTP Retransmission is explicitly bound to the payload type it is protecting, and thus will inherit it. However Generic FEC is a excellent example of an RTP payload type that has

no

natural media type. The media type for what it protects is not relevant as it is the recovered RTP packets that have a particular media type, and thus Generic FEC is best categorized as an application media type.

The above discussion is relevant to what limitations exist for RTP payload type usage within an RTP session that has multiple media types. In fact this document ([Section 7.2](#)) suggest that for usage

of

Generic FEC (XOR-based) as defined in [RFC 5109](#) can actually use a single media type when used with independent RTP sessions for source and repair data.

Note a particular SSRC carrying Generic FEC will clearly only protect a specific SSRC and thus that instance is bound to the SSRC's media type. For this specific case, it is possible to

have

one be applicable to both. However, in cases when the signalling is setup to enable fall back to using separate RTP sessions, then using a different media type, e.g. application, than the media being protected can create issues.

### **6.4. RTCP Considerations**

Guidelines for handling RTCP when sending multiple RTP streams with disparate rates in a single RTP session are outlined in [[I-D.ietf-avtcore-rtp-multi-stream](#)]. These guidelines apply when sending multiple types of media in a single RTP session if the different types of media have different rates.

## **7. Extension Considerations**

This section discusses the impact on some RTP/RTCP extensions due to usage of multiple media types in on RTP session. Only extensions where something worth noting has been included.





## 7.1. RTP Retransmission

SSRC-multiplexed RTP retransmission [[RFC4588](#)] is actually very straightforward. Each retransmission RTP payload type is explicitly connected to an associated payload type. If retransmission is only to be used with a subset of all payload types, this is not a problem, as it will be evident from the retransmission payload types which payload types have retransmission enabled for them.

Session-multiplexed RTP retransmission is also possible to use where an retransmission session contains the retransmissions of the associated payload types in the source RTP session. The only difference to the previous case is if the source RTP session is one which contains multiple media types. This results in the retransmission streams in the RTP session for the retransmission having multiple associated media types.

When using SDP signalling for a multiple media type RTP session, i.e.

[BUNDLE \[I-D.ietf-mmusic-sdp-bundle-negotiation\]](#), the session multiplexed case do require some recommendations on how to signal this. To avoid breaking the semantics of the FID grouping as defined

by [[RFC5888](#)] each media line can only be included in one FID group. FID is used by RTP retransmission to indicate the SDP media lines that is a source and retransmission pair. Thus, for SDP using BUNDLE, each original media source (m= line) that is retransmitted needs a corresponding media line in the retransmission RTP session. In case there are multiple media lines for retransmission, these media lines will form a independent BUNDLE group from the BUNDLE group with the source streams.

Below is an SDP example (Figure 1) which shows the grouping structures. This example is not legal SDP and only the most important attributes has been left in place. Note that this SDP is not an initial BUNDLE offer. As can be seen there are two bundle groups, one for the source RTP session and one for the retransmissions. Then each of the media sources are grouped with its retransmission flow using FID, resulting in three more groupings.



```
a=group:BUNDLE foo bar fiz
a=group:BUNDLE zoo kelp glo
a=group:FID foo zoo
a=group:FID bar kelp
a=group:FID fiz glo
m=audio 10000 RTP/AVP 0
a=mid:foo
a=rtpmap:0 PCMU/8000
m=video 10000 RTP/AVP 31
a=mid:bar
a=rtpmap:31 H261/90000
m=video 10000 RTP/AVP 31
a=mid:fiz
a=rtpmap:31 H261/90000
m=audio 40000 RTP/AVPF 99
a=rtpmap:99 rtx/90000
a=fmtp:99 apt=0;rtx-time=3000
a=mid:zoo
m=video 40000 RTP/AVPF 100
a=rtpmap:100 rtx/90000
a=fmtp:100 apt=31;rtx-time=3000
a=mid:kelp
m=video 40000 RTP/AVPF 100
a=rtpmap:100 rtx/90000
a=fmtp:100 apt=31;rtx-time=3000
a=mid:glo
```

Figure 1: SDP example of Session Multiplexed RTP Retransmission

## **7.2. Generic FEC**

The RTP Payload Format for Generic Forward Error Correction [[RFC5109](#)], and also its predecessor [[RFC2733](#)], requires some considerations, and they are different depending on what type of configuration of usage one has.

Independent RTP Sessions, i.e. where source and repair data are sent in different RTP sessions. As this mode of configuration requires different RTP session, there has to be at least one RTP session for source data, this session can be one using multiple media types.

The

repair session only needs one RTP Payload type indicating repair data, i.e. x/ulpfec or x/parityfec depending if [RFC 5109](#) or [RFC 2733](#) is used. The media type in this session is not relevant and can in theory be any of the defined ones. It is RECOMMENDED that one uses "Application".

If one uses SDP signalling with BUNDLE [[I-D.ietf-mmusic-sdp-bundle-negotiation](#)], then the RTP session



carrying the FEC streams will be its own BUNDLE group. The media line with the source stream for the FEC and the FEC stream's media line will be grouped using media line grouping using the FEC or FEC-FR [[RFC5956](#)] grouping. This is very similar to the situation that arise for RTP retransmission with session multiplexing discussed above in [Section 7.1](#).

In stream, using RTP Payload for Redundant Audio Data [[RFC2198](#)] combining repair and source data in the same packets. This is possible to use within a single RTP session. However, the usage and configuration of the payload types can create an issue. First of all it might be necessary to have one payload type per media type for the FEC repair data payload format, i.e. one for audio/ulpfec and one for text/ulpfec if audio and text are combined in an RTP session. Secondly each combination of source payload and its FEC repair data has to be an explicit configured payload type. This has potential for making the limitation of RTP payload types available into a real issue.

## **8. Signalling**

The Signalling requirements

Establishing an RTP session with multiple media types requires signalling. This signalling needs to fulfil the following requirements:

1. Ensure that any participant in the RTP session is aware that this is an RTP session with multiple media types.
2. Ensure that the payload types in use in the RTP session are using unique values, with no overlap between the media types.
3. Configure the RTP session level parameters, such as RTCP RR and RS bandwidth, AVPF trr-int, underlying transport, the RTCP extensions in use, and security parameters, commonly for the RTP session.
4. RTP and RTCP functions that can be bound to a particular media type SHOULD be reused when possible also for other media types, instead of having to be configured for multiple code-points.  
Note: In some cases one will not have a choice but to use multiple configurations.



### **8.1. SDP-Based Signalling**

The signalling of multiple media types in one RTP session in SDP is specified in "Multiplexing Negotiation Using Session Description Protocol (SDP) Port Numbers" [[I-D.ietf-mmusic-sdp-bundle-negotiation](#)].

## **9. IANA Considerations**

This document makes no request of IANA.

Note to RFC Editor: this section is to be removed on publication as an RFC.

## **10. Security Considerations**

Having an RTP session with multiple media types doesn't change the methods for securing a particular RTP session. One possible difference is that the different media have often had different security requirements. When combining multiple media types in one session, their security requirements also have to be combined by selecting the most demanding for each property. Thus having multiple media types can result in increased overhead for security for some media types to ensure that all requirements are met.

Otherwise, the recommendations for how to configure an RTP session do not add any additional requirements compared to normal RTP, except for the need to be able to ensure that the participants are aware that it is a multiple media type session. If not that is ensured it can cause issues in the RTP session for both the unaware and the aware one. Similar issues can also be produced in an normal RTP session by creating configurations for different end-points that doesn't match each other.

## **11. Acknowledgements**

The authors would like to thank Christer Holmberg, Gunnar Hellstroem, and Charles Eckel for the feedback on the document.

## **12. References**

### **12.1. Normative References**

[I-D.ietf-avtcore-rtp-multi-stream]  
Lennox, J., Westerlund, M., Wu, W., and C. Perkins,  
"Sending Multiple Media Streams in a Single RTP Session",  
[draft-ietf-avtcore-rtp-multi-stream-06](#) (work in  
progress),  
October 2014.





[I-D.ietf-mmusic-sdp-bundle-negotiation]

Holmberg, C., Alvestrand, H., and C. Jennings,  
"Negotiating Media Multiplexing Using the Session  
Description Protocol (SDP)", [draft-ietf-mmusic-sdp-](#)

[bundle-](#)

[negotiation-17](#) (work in progress), March 2015.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate  
Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.

[RFC3550] Schulzrinne, H., Casner, S., Frederick, R., and V.  
Jacobson, "RTP: A Transport Protocol for Real-Time  
Applications", STD 64, [RFC 3550](#), July 2003.

[RFC3551] Schulzrinne, H. and S. Casner, "RTP Profile for Audio and  
Video Conferences with Minimal Control", STD 65, [RFC](#)

[3551](#),

July 2003.

## **12.2. Informative References**

[I-D.ietf-avtcore-multiplex-guidelines]

Westerlund, M., Perkins, C., and H. Alvestrand,  
"Guidelines for using the Multiplexing Features of RTP to  
Support Multiple Media Streams", [draft-ietf-avtcore-](#)  
[multiplex-guidelines-03](#) (work in progress), October 2014.

[I-D.ietf-avtcore-rtp-topologies-update]

Westerlund, M. and S. Wenger, "RTP Topologies", [draft-](#)  
[ietf-avtcore-rtp-topologies-update-06](#) (work in progress),  
March 2015.

[I-D.ietf-avtext-rtp-grouping-taxonomy]

Lennox, J., Gross, K., Nandakumar, S., and G. Salgueiro,  
"A Taxonomy of Grouping Semantics and Mechanisms for

Real-

Time Transport Protocol (RTP) Sources", [draft-ietf-](#)

[avtext-](#)

[rtp-grouping-taxonomy-06](#) (work in progress), March 2015.

[I-D.ietf-dart-dscp-rtp]

Black, D. and P. Jones, "Differentiated Services  
(DiffServ) and Real-time Communication", [draft-ietf-dart-](#)  
[dscp-rtp-10](#) (work in progress), November 2014.

[I-D.lennox-payload-ulp-ssrc-mux]

Lennox, J., "Supporting Source-Multiplexing of the Real-  
Time Transport Protocol (RTP) Payload for Generic Forward  
Error Correction", [draft-lennox-payload-ulp-ssrc-mux-00](#)  
(work in progress), February 2013.



[I-D.westerlund-avtcore-transport-multiplexing]

Westerlund, M. and C. Perkins, "Multiplexing Multiple RTP Sessions onto a Single Lower-Layer Transport", [draft-westerlund-avtcore-transport-multiplexing-07](#) (work in progress), October 2013.

[RFC2198] Perkins, C., Kouvelas, I., Hodson, O., Hardman, V., Handley, M., Bolot, J., Vega-Garcia, A., and S. Fosse-Parisis, "RTP Payload for Redundant Audio Data", [RFC](#)

[2198](#),

September 1997.

[RFC2733] Rosenberg, J. and H. Schulzrinne, "An RTP Payload Format for Generic Forward Error Correction", [RFC 2733](#), December 1999.

[RFC4566] Handley, M., Jacobson, V., and C. Perkins, "SDP: Session Description Protocol", [RFC 4566](#), July 2006.

[RFC4588] Rey, J., Leon, D., Miyazaki, A., Varsa, V., and R. Hakenberg, "RTP Retransmission Payload Format", [RFC 4588](#), July 2006.

[RFC5109] Li, A., "RTP Payload Format for Generic Forward Error Correction", [RFC 5109](#), December 2007.

[RFC5576] Lennox, J., Ott, J., and T. Schierl, "Source-Specific Media Attributes in the Session Description Protocol (SDP)", [RFC 5576](#), June 2009.

[RFC5761] Perkins, C. and M. Westerlund, "Multiplexing RTP Data and Control Packets on a Single Port", [RFC 5761](#), April 2010.

[RFC5888] Camarillo, G. and H. Schulzrinne, "The Session Description Protocol (SDP) Grouping Framework", [RFC 5888](#), June 2010.

[RFC5956] Begen, A., "Forward Error Correction Grouping Semantics in the Session Description Protocol", [RFC 5956](#), September 2010.

Authors' Addresses



Magnus Westerlund  
Ericsson  
Farogatan 6  
SE-164 80 Kista  
Sweden

Phone: +46 10 714 82 87  
Email: [magnus.westerlund@ericsson.com](mailto:magnus.westerlund@ericsson.com)

Colin Perkins  
University of Glasgow  
School of Computing Science  
Glasgow G12 8QQ  
United Kingdom

Email: [csp@csperkins.org](mailto:csp@csperkins.org)

Jonathan Lennox  
Vidyo, Inc.  
433 Hackensack Avenue  
Seventh Floor  
Hackensack, NJ 07601  
US

Email: [jonathan@vidyo.com](mailto:jonathan@vidyo.com)

