

RMT
Internet-Draft
Expires: July 31, 2006

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January 27, 2006

SDP Descriptors for FLUTE
draft-mehta-rmt-flute-sdp-05

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Abstract

This document specifies the use of SDP to describe the parameters required to begin, join, receive data from, and/or end FLUTE sessions. It also provides a Composite Session SDP media grouping

Internet-Draft

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January 2006

semantic for grouping media streams into protocol-specific sessions, such as multiple-channel FLUTE sessions.

Table of Contents

1.	Introduction	3
2.	Conventions Used in This Document	4
3.	FLUTE Descriptors	5
3.1.	FLUTE Protocol Identifier	5
3.2.	Composite Session Semantics	6
3.2.1.	Composite Session Semantics for FLUTE Sessions	7
3.3.	Source IP Address	8
3.4.	Transport Session Identifier	9
3.5.	Session Timing Parameters	10
3.6.	Channelisation Descriptors	10
3.6.1.	Number of Channels	10
3.6.2.	Destination IP Address and Port Number for Channels	11
3.7.	FEC Object Transmission Information	13
3.8.	Content Description Pointer	15
3.9.	Bandwidth Specification	15
3.9.1.	Bandwidth Specification for Composite Sessions	16
4.	SDP Syntax Examples	17
5.	Security Considerations	20
6.	IANA Considerations	21
6.1.	Transport Protocol	21
6.1.1.	Media formats ("fmt")	21
6.2.	Attribute Names	21
6.3.	Composite Session Token to Differentiate FLUTE Sessions	22
7.	Acknowledgements	24
8.	Contributors	25
9.	References	26
9.1.	Normative References	26
9.2.	Informative References	27
Appendix A.	Use of FEC attributes with RTP sessions (informative)	28
	Authors' Addresses	29
	Intellectual Property and Copyright Statements	30

[1.](#) Introduction

The Session Description Protocol (SDP) [\[6\]](#) provides a general-purpose format for describing multimedia sessions in announcements or invitations. SDP uses an entirely textual data format (the US-ASCII subset of UTF-8 [\[9\]](#)) to maximize portability among transports. SDP does not define a protocol, but only the syntax to describe a multimedia session with sufficient information to participate in that session. Session descriptions may be sent using arbitrary existing application protocols for transport (e.g. FLUTE [\[1\]](#), SAP [\[15\]](#), SIP [\[16\]](#), RTSP [\[20\]](#), HTTP [\[17\]](#), email etc.).

SDP defines two protocol identifiers that represent unreliable connectionless protocols. These are RTP/AVP and UDP. These are appropriate choices for multimedia streams. [\[18\]](#) defines protocol identifiers for connection-oriented reliable transports: TCP and TCP/TLS. [RFC 3266](#) [\[7\]](#) describes SDP support for IPv6.

This document defines a new protocol identifier for File Delivery over Unidirectional Transport (FLUTE) protocol [\[1\]](#) and other required SDP attributes for initiating a FLUTE session. The formal ABNF syntax [\[5\]](#) is used for the attributes. This SDP syntax is independent of Any Source Multicast (ASM) or Source Specific Multicast (SSM) is used to route the media.

2. Conventions Used in This Document

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](#) [2].

[3.](#) FLUTE Descriptors

The FLUTE specification [[1](#)] describes the optional and required parameters for a FLUTE session. This document specifies the SDP parameters for FLUTE sessions that can be used for the discovery of FLUTE download and/or service announcement sessions.

The required parameters are:

- o The source IP address
- o The number of channels in the session
- o The destination IP address and port number for each channel in the session
- o The Transport Session Identifier (TSI) of the session
- o The start time and end time of the session

Optionally, the following parameters may be associated with the session:

- o FEC Object Transmission Information
- o Some information that tells receiver in the first place, that the session contains files that are of interest
- o Bandwidth specification

The description of these parameters in SDP is presented in the following sections. Note also that "v=", "o=" and "s=" lines are mandatory for SDP descriptions [6].

The semantics of a FLUTE session within an SDP description differ slightly from that of the well-establish RTP session descriptions. A FLUTE session includes one or more FLUTE channels which are each a distinct media flow. Generally, each RTP media is recognised as a distinct RTP media session. Hence, to preserve harmony with RTP media sessions within SDP descriptions, the optional Composite Session mechanism is specified, using the grouping framework [13].

[3.1.](#) FLUTE Protocol Identifier

The following is the ABNF syntax for an "m=" line, as specified by [RFC 2327](#) [6]:

media-field = "m=" media SP port ["/" integer] SP

proto 1*(SP fmt) CRLF

We define a new value for the "proto" sub-field: FLUTE/UDP. The FLUTE/UDP protocol identifier specifies that the session being described will use the FLUTE [1] protocol on top of a UDP connection.

As described below, more than one FLUTE session may be described by a single SDP using the Composite Session mechanism.

The fmt (format) list may be ignored for FLUTE. The fmt list of FLUTE "m=" lines MAY contain a single "*" character to indicate that miscellaneous and unspecified MIME types (file formats) are contained in the FLUTE session. Use of any other values (MIME types) in a FLUTE fmt list is out of scope of this specification. "0" is known to be used in the fmt list to represent the same as "*", in a non

standard way, and so implementers may take this into account. An example of FLUTE/UDP protocol identifier is shown in [section 4](#).

FLUTE is a general file delivery protocol and so it is not considered necessary to identify a list of media types per FLUTE session or channel in the session description.

[3.2](#). Composite Session Semantics

The Composite Session mechanism enables the grouping of media lines in to distinct sessions. The complete Composite Session semantics are protocol-specific - as determined by the protocol id of the grouped media lines. This section defines the Composite Session semantic generically and protocol id independently. The following subsection defines the FLUTE/UDP protocol id specific semantic.

The Composite Session mechanism inherits the "group" and "mid" attributes from the SDP grouping framework [[13](#)] and introduces the "CS" (Composite Session) token. When a complete SDP description specifies only one FLUTE session, using the Composite Session mechanism is OPTIONAL. When a complete SDP description specifies more than one FLUTE session, using the Composite Session mechanism is REQUIRED.

When the Composite Session mechanism is used: the SDP grouping framework [[13](#)] MUST be used (and requirements from that are inherited); and the "CS" token MUST be used with the "group" attribute to indicate a Composite Session grouping. The SDP grouping framework declares groups at session-level and labels media (with the "mid" attribute) at media-level. Hence, all media identified by their "mid" values by an "a=group:CS" line belong to the same Composite Session group and inherit the grouping specified for that value at session-level.

The first media line declared for a Composite Session group is the Primary Media. Just as session-level attributes are inherited to media-level declarations (unless specifically overwritten by an additional media-level attribute), Primary Media attributes SHALL be inherited to all media of a particular Composite Session group and these MAY be overwritten where an attribute syntax allows.

[3.2.1](#). Composite Session Semantics for FLUTE Sessions

The Composite Session provides an unambiguous way to define multiple FLUTE sessions as distinct from multiple the media-sessions semantics of RTP. It is useful for describing more than one FLUTE session in an SDP instance and so its use and support are OPTIONAL. For SDP instances which describe multiple FLUTE sessions, the Composite Session semantics MUST be used. Whenever an SDP describes just one FLUTE session with more than a single media stream of FLUTE protocol id, use of Composite Session semantics is RECOMMENDED.

To support simple applications, as well as ensure harmony with FLUTE SDP standards outside of the IETF [21], when the Composite Session mechanism is not used for media of the UDP/FLUTE protocol, exactly one FLUTE session is specified within the SDP description and all UDP/FLUTE media that SDP description belong to the same FLUTE session (this is known as the Restricted Behaviour).

The Composite Session mechanism SHOULD NOT be used where the target clients are expected to include simpler FLUTE SDP parsers, such as in 3GPP MBMS [21]. In this Restricted Behaviour only UDP/FLUTE media SHALL be described.

A partial example of using the Composite Session mechanism for FLUTE is shown below.

```
<other session-level attributes>
a=group:CS 1 2
a=group:CS 3
m=application 12345 FLUTE/UDP *
a=mid:1
<other media-level attributes>
m=application 12346 FLUTE/UDP *
a=mid:2
<other media-level attributes>
m=application 56789 FLUTE/UDP *
a=mid:3
<other media-level attributes>
```

The example shows two groups with the 1st and 3rd media ("m=") lines (mid values 1 and 3) being the Primary Media for each group

respectively. In the example, the media with mid value "2" inherits

attributes of the media with mid value "1".) Each of these groups identifies a separate FLUTE Session. Several of the attributes subsequently specified in this document use this feature of Primary Media inheritance to all media of a Composite Session.

The Composite Session mechanism solves the problem of describing multiple FLUTE sessions in a single SDP instance. However, this does not place any restrictions on the use of the Composite Session mechanism with transport protocols other than FLUTE/UDP, nor on whether a complete SDP would include media of other transport protocols too. Specification of semantics beyond the use of FLUTE sessions is outside the scope of this document.

[3.3](#). Source IP Address

The Asynchronous Layered Coding (ALC) [[3](#)] and the Layered Coding Transport (LCT) [[4](#)] specifications require that all the channels of a single ALC/LCT session are from the same source IP address. Hence, there MUST be exactly one source IP address per FLUTE session, and therefore one source IP address per each description of a FLUTE session description. Restricted behaviour is one source IP address per each complete SDP. Where multiple FLUTE sessions are described within one SDP instance this means one source IP address per each Composite Session.

The source IP address MUST be defined according to the source-filter attribute ("a=source-filter") [[8](#)], with the following exceptions:

- o The source-filter attribute MUST be included in any SDP describing FLUTE per FLUTE session described.
- o The number of source-filter attributes in any SDP describing FLUTE must be exactly equal to the number of FLUTE sessions described in that SDP.
- o In the restricted behaviour of only one FLUTE session description in an SDP and no use of the Composite Session mechanism: The source-filter attribute MUST be in the session part of the session description and MUST NOT be given per media. Note, the requirement that there must not be more than a single source-filter attribute in the session part is inherited from [[8](#)].
- o Where the Composite Session mechanism is used: The source-filter attribute MUST be in the media part of Primary Media of each distinct FLUTE session, and MUST NOT be given in other media declarations but these, nor in the session-level part of the SDP.

- o Exactly one source address is specified by any instance of this attribute. Exactly one source address MUST be given in an inclusive-mode "src-list". Exclusive-mode MUST NOT be used.
- o The "*" value MUST be used for the "dest-address" sub-field, even when the FLUTE session employs only a single channel (e.g. a multicast group).

An example of the use of this attribute is:

```
a=source-filter: incl IN IP6 * 2001:210:1:2:240:96FF:FE25:8EC9
```

This example uses the source-filter attribute to describe an IPv6 source address.

[3.4.](#) Transport Session Identifier

Without additional grouping of media lines, the restricted behaviour of a host is to group all media of a single SDP with the FLUTE/UDP protocol identifier as belonging to the same single FLUTE session.

The combination of the TSI and the source IP address identifies a FLUTE session. Each TSI MUST uniquely identify a FLUTE session for a given source IP address during the time that the session is active and also for a large time before and after the active session time. This requirement is also specified by [\[4\]](#). The TSI MUST be described by the "flute-tsi" attribute.

There MUST be exactly one occurrence of the "flute-tsi" attribute per FLUTE session description of a SDP description.

- o The number of "flute-tsi" attributes in any SDP describing FLUTE must be exactly equal to the number of FLUTE sessions described in that SDP.
- o In the restricted behaviour of only one FLUTE session description in an SDP and no use of the Composite Session mechanism: The "flute-tsi" attribute MUST be in the session part of the session description and MUST NOT be given per media. A "flute-tsi" attribute in the session-part SHALL be used to identify restricted behaviour.
- o Where the Composite Session mechanism is used: The "flute-tsi" attribute MUST be in the media part of Primary Media of each distinct FLUTE session, and MUST NOT be given in other media declarations but these, and MUST NOT be given in the session-level

part of the SDP.

The syntax for the attribute in ABNF is given below:

```
flute-tsi-line = "a=flute-tsi:" tsi CRLF
tsi = 1*DIGIT
```

[3.5.](#) Session Timing Parameters

The SDP timing field "t=" [\[6\]](#) MUST be used to indicate the FLUTE session start and end times. This value applies to all FLUTE and transport sessions defined in a single SDP instance and, thus, FLUTE sessions of different timing values need to be declared in different SDP instances.

[3.6.](#) Channelisation Descriptors

This section specifies the description of the channel(s) used within a FLUTE session. The required parameters for channelisation description are:

- o Number of channels
- o Destination IP address and port number for channels

[3.6.1.](#) Number of Channels

The FLUTE specification allows the use of multiple channels (e.g. multicast groups) to transport the files of a single FLUTE session. This is referred to as FLUTE session channelisation in this document. A FLUTE channel is equivalent to an ALC/LCT channel. An ALC/LCT channel is defined by the combination of a sender and an address associated with the channel by the sender. Details of each channel are defined by SDP media-level information also described in this document. The number of channels is calculated by summing the number of unique destination IP address and port number pairs for a certain FLUTE session (assignment of media to FLUTE sessions is done with presence of absence of the Composite Session grouping).

The OPTIONAL "flute-ch" attribute describes the number of channels used by the source to transmit the FLUTE session. When present, it

is used to validate the channel number calculation based on the number of destination address/port pairs, and it is expected to be used where SDP proxies and other automatic and manual editing that introduces errors would cause bad failure conditions at the client.

When the "flute-ch" attribute is used:

- o The number of "flute-ch" attributes in any SDP describing FLUTE MUST be exactly equal to the number of FLUTE sessions described in

that SDP. A client SHOULD discard all of an SDP instance if this condition is not met. Alternative behaviour, such as retries at delivery, error reporting and partial use of SDP instances known to include errors, are allowed but beyond the scope of this document.

- o In the restricted behaviour of only one FLUTE session description in an SDP and no use of the Composite Session mechanism: The "flute-ch" attribute MUST be in the session part of the session description and MUST NOT be given per media.
- o Where the Composite Session mechanism is used: The "flute-ch" attribute MUST be in the media part of Primary Media of each distinct FLUTE session, and MUST NOT be given in other media declarations but these, nor in the session-level part of the SDP.

The syntax for the attribute in ABNF is given below:

```
flute-channel-line = "a=flute-ch:" ch CRLF
ch = integer
;integer is as defined in [6].
```

value is the number of channels used by the source to transmit data in a FLUTE session.

[3.6.2.](#) Destination IP Address and Port Number for Channels

SDP media-level information describes one or more channels. The channel parameters MUST be given per channel and are:

- o Destination IP address

- o Destination port number

The destination IP address MUST be defined according to the connection data field ("c=") of SDP [6]. The destination port number MUST be defined according to the "port" sub-field of the media description field ("m=") of SDP [6].

A "c=" line can describe multiple addresses by using "number of addresses" sub-field, and also an "m=" line can describe multiple ports by using "number of ports" sub-field. So multiple channels can be described by using one "c=" line and one "m=" line (slash notation).

When more than one channel is used in a multicast FLUTE session, it is RECOMMENDED that the channels are differentiated based on destination IP address, and channels are not differentiated based on

destination port (although those ports could be same or different for each channels). When more than one channel is used in a unicast FLUTE session, the channels have to be differentiated based on destination ports, as only one destination IP address could be used. Whenever channels are differentiated based on destination port number they must use the same destination IP address for that FLUTE session.

In the case (always with a unicast session) where the same destination IP address is used for all the channels of the session and only the destination port number differentiates channels, the destination IP address MAY be given by the connection data field at session-level for all channels (if so, the connection data field MUST NOT be used at media-level).

In the case where each channel has a different destination IP address, the destination IP addresses MUST be given at media-level, i.e. following an "m=" line.

The sequence of multiple channels MUST be determined by the order in which their media descriptions are defined in the session description (i.e. the first media description gives the first channel in the sequence). This applies individually to each FLUTE session of an SDP whether one or more FLUTE sessions are described. In the case of the slash notation usage for specifying multiple destination addresses or ports, the order of the channel sequence MUST be lowest value first

and highest last. (Note, slash notation for both destination IP address and port would be incompatible with requirement to not use both destination IP address and port to differentiate channels in a FLUTE session and thus slash notation for both destination IP address and port is not allowed for a single media.)

Also we need to indicate the presence of a FLUTE session on a certain channel. This is done by using the "m=" line in the SDP description as shown in the following example:

```
m=application 12345 FLUTE/UDP *  
c=IN IP6 FF1E:03AD::7F2E:172A:1E24
```

In the above SDP attributes, the "m=" line indicates the media used and the "c=" line together with "m=" line's "port" sub-field indicates the corresponding channel's address and port respectively. Thus, in the above example, the media is transported on a channel that uses FLUTE over UDP. Further, the "c=" line indicates the channel's address, which, in this case, is an IPv6 address, and "m=" line indicates the channel's port (12345).

Note, the value of the destination IP address implicitly indicated whether a multicast media belongs to an ASM or a SSM group as

described by [\[19\]](#).

[3.7.](#) FEC Object Transmission Information

An SDP description for a FLUTE session MAY include FEC Object Transmission Information (FEC-OTI) [\[12\]](#). FEC parameters can be placed either at session-level or at media-level, although it is RECOMMENDED to place them at session-level. Furthermore, if FEC parameters are placed at media-level (contrary to the recommendation) and the Composite Session mechanism is used, they should only be placed in the Primary Media for any FLUTE session description. If FEC declarations on both session-level and media-level use the same reference number (fec-ref) then the media-level declaration takes precedence for that media component. FEC parameters include:

- o FEC Encoding ID
- o FEC Instance ID (for FEC Encoding IDs 128-255)

Where FEC-OTI is given, FEC parameters MUST be described in a "FEC-declaration" attribute. Multiple instances of this attribute MAY exist both at session-level and media-level. If an instance exists at session-level (or in a Primary Media), a reference to it MAY be used at media-level, and an attribute "FEC" MUST be defined for this purpose. The absence of both a "FEC-declaration" and a "FEC" attribute at media-level MUST be interpreted as the default FEC (Compact No-Code FEC [[11](#)] for FLUTE).

The syntax for the attributes in ABNF is given below:

```
fec-declaration-line = "a=FEC-declaration:" fec-ref SP
                        fec-enc-id [";" SP fec-inst-id] CRLF
fec-ref = 1*3DIGIT
;value is the SDP-internal identifier for FEC-declaration

fec-enc-id = "encoding-id=" enc-id
enc-id = 1*DIGIT
;value is the FEC Encoding ID used

fec-inst-id = "instance-id=" inst-id
inst-id = 1*DIGIT
;value is the FEC Instance ID used

fec-line = "a=FEC:" fec-ref CRLF
```

Examples of FEC-OTI are shown in [section 4](#).

The FEC parameters are for capabilities description for the session.

(Note, any "FDT-like" fuller description of files in the session could give the FEC parameters per file). FLUTE's FDT syntax (and codepoint header field usage) allows complete specification of these FEC parameters in-band with FLUTE (per file). Thus machine configuration can be performed using FLUTE alone.

There are five main reasons that the FEC Encoding and Instance IDs are optional capabilities descriptions:

1. It is not always necessary to explicitly describe the FEC capabilities in advance of the session - e.g. for simple (and

short) sessions it can be more elegant to discover this from the session (FDT) itself (even when some mechanism for machine-readable session parameters, such as IP addresses and ports, is wanted in advance).

2. There may be some other out-of-band discovery of FEC capability requirements (e.g. well known-FEC/standardised capabilities for a certain application, verbal agreement between a group, etc.) that provides the FEC capability information. This document does not want to prevent this, and in this case repeating the information in SDP would be unnecessary and wasteful (and probably result in implementations not following the flute-sdp specification).
3. FLUTE defaults to Compact No-Code FEC [[11](#)] and support for this is mandatory for FLUTE anyway so it is a given (capability requirement) which does not need to be described by the SDP. In cases where only Compact No-Code FEC is required, there is no use in specifying any FEC Encoding (and Instance) IDs in the SDP (though it is allowed).
4. In cases where a FLUTE session description (SDP file) is not defined once for all time, it is possible that the FEC usage is not known in advance and the FEC capabilities would only be added to the SDP in a later version of that SDP file when the FEC codes have been selected (e.g. a larger audience may suggest stronger FEC to make FLUTE delivery more reliable, whereas additional bi-directional messages may be scalable for smaller groups).
5. Also, in cases where a FLUTE session description (SDP file) is very static (e.g. once for all time for that session), it is possible that the FEC usage is not known in advance and it needs to be left to some other mechanism (e.g. FDT) to discover any FEC capability requirements set closer to the session transmission - with the same examples as in (4).

Also, in a complex case of very many FEC codes being used in the session giving a full list in SDP is not seen as being reasonable

(but this is likely to be a rare case anyway).

The identification and description of any congestion control (CC) instance related to layered media (multiple FLUTE channels) is

orthogonal to the FEC declarations and other aspects of this document. Hence, CC descriptions are not in scope of this document.

[3.8.](#) Content Description Pointer

The syntax of the information that tells receiver, in the first place, that the session contains files that are of interest is out of scope of this document. However, the SDP MAY include a content description pointer at the session-level and/or media-level (including Primary Media of Composite Sessions) to enable efficient linkage to such information.

The content description pointer attribute describes to the receiver(s) the URI where the content description is stored. The content description pointer MUST be defined according to the "content-desc" attribute.

The syntax for the attribute in ABNF is given below:

```
content-desc-line = "a=content-desc:" URI-reference CRLF
;URI-reference is as defined in \[10\].
```

An example of content description pointer is shown in [section 4](#).

[3.9.](#) Bandwidth Specification

The specification of bandwidth (data rate) is OPTIONAL and where included in the SDP it SHALL adhere to the following rules.

The maximum bit-rate required by a particular FLUTE media line (one or more FLUTE channels, depending on the usage or IP address and port ranges) MAY be specified. In this case it is RECOMMENDED to use the TIAS bandwidth modifier [\[\[14\]\]](#) on media-level, although the AS bandwidth modifier [\[\[6\]\]](#) MAY be used on media-level.

The session bit-rate MAY also be specified. In this case it is RECOMMENDED to use the TIAS bandwidth modifier and the "a=maxprate" attribute for the session, and again AS is optional but not recommended.

TIAS is generally preferred as it allows the calculation of the bit-rate in environments with translation of IP version or transport protocol, where as AS does not and thus adds significant complexity in such environments.

Any Transport Independent (TIAS) bandwidth SHALL be the largest sum of the sizes of all FLUTE/UDP packets transmitted during any one second long period of the FLUTE session, depending on which level it is being used, expressed as kilobits. The size of the packet SHALL include all FLUTE, ALC, LCT and any extensions headers and payload. IP and UDP headers are excluded from the TIAS bit-rate calculation. Any Application Specific (AS) bandwidth SHALL be the largest sum of the sizes of all FLUTE/UDP packets transmitted during any one second long period for the related media line(s), expressed as kilobits. The size of the packet SHALL be the complete packet, i.e. IP, UDP and FLUTE headers, and the data payload.

[3.9.1.](#) Bandwidth Specification for Composite Sessions

Where the multimedia session bit-rate is specified (at SDP session level) this applies to all media, irrespective of whether the Composite Session mechanism is used to describe multiple sessions (e.g. multiple FLUTE sessions). So if multiple Composite Sessions are described in a single SDP and SDP session-level bit-rate is described, this session-level bit-rate would not relate to any single Composite Session.

A normal TIAS or AS bit-rate declaration at the Primary Media level is to be interpreted as media-specific and not imply any inheritance to other media of the same Composite Session. It is RECOMMENDED that aggregate Composite Session bandwidth is calculated as the sum of all constituent media bit-rate declarations. Specification of a descriptor specifically for aggregate Composite Session bandwidth is beyond the scope of this document.

[4.](#) SDP Syntax Examples

This section gives examples of the use of SDP attributes to describe a FLUTE session.

```
v=0
o=user123 2890844526 2890842807 IN IP6 2201:056D::112E:144A:1E24
s=File delivery session example
i=More information
t=2873397496 2873404696
a=source-filter: incl IN IP6 * 2001:210:1:2:240:96FF:FE25:8EC9
a=flute-tsi:1
a=flute-ch:2
a=FEC-declaration:0 encoding-id=0
a=FEC-declaration:1 encoding-id=128; instance-id=0
a=content-desc:http://www.example.com/flute-sessions/session001
m=application 12345 FLUTE/UDP *
c=IN IP6 FF1E:03AD::7F2E:172A:1E24
a=FEC:0
m=application 12346 FLUTE/UDP *
c=IN IP6 FF1E:03AD::7F2E:172A:1E25
a=FEC:1
```

Figure 1: An SDP for FLUTE Session with Two Channels

Figure 1 shows an example SDP description for FLUTE session with two channels.

The attribute defined in the line "a=source-filter: incl IN IP6 * 2001:210:1:2:240:96FF:FE25:8EC9" describes a source filter. In this example the source indicates that the receiver(s) should include the given IP address (2001:210:1:2:240:96FF:FE25:8EC9) into the session. It should be noted that although other possibilities may be used, in this case only the incl and * attributes may be used in the above attribute.

The attribute defined in the line "a=flute-tsi:3" describes the Transport Session Identifier for the session. The pair made of the source IP address and the TSI together uniquely identifies a FLUTE session.

The source indicates in the above example that it will transmit data in the FLUTE session on two channels (a=flute-ch:2). The source then specifies the channels.

The "a=FEC-declaration" lines describes two different FEC schemes used in the FLUTE session.

The "a=content-desc" line describes the URI where the content description is stored.

The line "m=application 12345 FLUTE/UDP *" indicates the media used for the channel. In this example, there are two "m=" lines for the two channels described.

The destination addresses for the channels are given in the "c=" lines. These also show to the receiver(s) that the channels are two (maybe more in other cases) consecutive channels.

The "a=FEC" lines at media-level reference FEC declarations at session-level ("a=FEC-declaration").

```
v=0
o=user123 2890844526 2890842807 IN IP6 2201:056D::112E:144A:1E24
s=File delivery session example
i=More information
t=2873397496 2873404696
a=source-filter: incl IN IP6 * 2001:210:1:2:240:96FF:FE25:8EC9
a=flute-tsi:2
a=flute-ch:1
m=application 12345 FLUTE/UDP *
c=IN IP6 FF1E:03AD::7F2E:172A:1E24
a=FEC-declaration:0 encoding-id=128; instance-id=0
```

Figure 2: An SDP for FLUTE Session with One Channel

Figure 2 shows an example SDP description for FLUTE session with one channel.

```
v=0
o=user123 2890844526 2890842807 IN IP6 2201:056D::112E:144A:1E24
s=File delivery session example
i=More information
t=2873397496 2873404696
a=source-filter: incl IN IP6 * 2001:210:1:2:240:96FF:FE25:8EC9
a=FEC-declaration:0 encoding-id=0
a=FEC-declaration:1 encoding-id=128; instance-id=0'
a=group:CS 1 2
a=group:CS 3 4
m=application 12345 FLUTE/UDP *
c=IN IP6 FF1E:03AD::7F2E:172A:1E24
a=flute-tsi:1
a=FEC:0
a=mid:1
m=application 12346 FLUTE/UDP *
c=IN IP6 FF1E:03AD::7F2E:172A:1E25
a=mid:2
m=application 12347 FLUTE/UDP *
c=IN IP6 FF1E:03AD::7F2E:172A:1E26
a=flute-tsi:2
a=FEC:1
a=mid:3
m=application 12348 FLUTE/UDP *
c=IN IP6 FF1E:03AD::7F2E:172A:1E27
a=mid:4
```

Figure 3: An SDP for composite FLUTE session

Figure 3 shows an example SDP description for composite FLUTE session.

[5.](#) Security Considerations

See [\[6\]](#) for security considerations specific to the Session Description Protocol in general. See also [\[8\]](#) for security consideration related to source address filters.

[6.](#) IANA Considerations

[6.1.](#) Transport Protocol

The "proto" sub-field of the media description field ("m=") describes the transport protocol used. This document registers one value: "FLUTE/UDP" is a reference to FLUTE [[1](#)] running over UDP/IP.

[6.1.1.](#) Media formats ("fmt")

FLUTE media using the "FLUTE/UDP" proto value may use the character "*" as their "fmt" value. The "*" character represents a wild card

which indicates that miscellaneous and unspecified MIME types are contained in the FLUTE session. Alternatively a list of MIME types (file formats) may be given in the "fmt" list. These formats SHOULD be registered. Use of an existing MIME subtype for the format is encouraged. If no MIME subtype exists, it is RECOMMENDED that a suitable one is registered through the IETF process ([RFC 2048](#)).

[6.2.](#) Attribute Names

As recommended by [\[6\]](#), the new attribute names "flute-tsi", "flute-ch", "FEC-declaration", "FEC", "FEC-OTI-extension" and "content-desc" should be registered with IANA, as follows:

The following contact information shall be used for all registrations included here:

Contact: Rod Walsh
E-Mail: rod.walsh (at) nokia.com

SDP Attribute ("att-field"):

Attribute name: flute-tsi
Long form: FLUTE Transport Session Identifier
Type of name: att-field
Type of attribute: Session level or media level
Subject to charset: No
Purpose: See this document
Reference: This document
Values: See this document

SDP Attribute ("att-field"):

Attribute name: flute-ch
Long form: Number of Channels in a FLUTE Session
Type of name: att-field
Type of attribute: Session level or media level
Subject to charset: No
Purpose: See this document

Reference: This document
Values: See this document

SDP Attribute ("att-field"):

Attribute name: FEC-declaration

Long form: Forward Error Correction Declaration
Type of name: att-field
Type of attribute: Session level or media level
Subject to charset: No
Purpose: See this document
Reference: This document
Values: See this document

SDP Attribute ("att-field"):

Attribute name: FEC
Long form: A Reference to FEC Declaration
Type of name: att-field
Type of attribute: Media level
Subject to charset: No
Purpose: See this document
Reference: This document
Values: See this document

SDP Attribute ("att-field"):

Attribute name: FEC-OTI-extension
Long form: FEC Object Transmission Information extension
Type of name: att-field
Type of attribute: Session level or media level
Subject to charset: No
Purpose: See this document
Reference: This document
Values: See this document

SDP Attribute ("att-field"):

Attribute name: content-desc
Long form: Content Description Pointer
Type of name: att-field
Type of attribute: Session level or media level
Subject to charset: No
Purpose: See this document
Reference: This document
Values: See this document

[6.3.](#) Composite Session Token to Differentiate FLUTE Sessions

IANA needs to register the following new 'semantics' attribute for the SDP grouping framework [\[13\]](#):

Semantics	Token	Reference
-----	-----	-----
Composite Session	CS	[RFCxxxx]

It should be registered in the SDP parameters registry (<http://www.iana.org/assignments/sdp-parameters>) under Semantics for the "group" SDP Attribute.

[7.](#) Acknowledgements

The authors would like to thank all the people who gave feedback on this document.

Internet-Draft

SDP Descriptors for FLUTE

January 2006

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[9.](#) References

[9.1.](#) Normative References

- [1] Paila, T., Walsh, R., Luby, M., Lehtonen, R., and V. Roca, "FLUTE - File Delivery over Unidirectional Transport", [draft-ietf-rmt-flute-revised-01](#) (work in progress), January 2006.
- [2] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [RFC 2119](#), [BCP 14](#), March 1997.
- [3] Luby, M., Watson, M., Gemmell, J., Vicisano, L., Rizzo, L., and J. Crowcroft, "Asynchronous Layered Coding (ALC) Protocol Instantiation", [draft-ietf-rmt-pi-alc-revised-01](#) (work in progress), October 2005.
- [4] Luby, M., Watson, M., Gemmell, J., Vicisano, L., Rizzo, L., Handley, M., and J. Crowcroft, "Layered Coding Transport (LCT) Building Block", [draft-ietf-rmt-bb-lct-revised-01](#) (work in progress), October 2005.
- [5] Crocker, D. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", [RFC 2234](#), November 1997.
- [6] Handley, M. and V. Jacobson, "SDP: Session Description Protocol", [RFC 2327](#), April 1998.

- [7] Olson, S., Camarillo, G., and A. Roach, "Support for IPv6 in Session Description Protocol (SDP)", [RFC 3266](#), June 2002.
- [8] Quinn, B. and R. Finlayson, "Session Description Protocol (SDP) Source Filters", [draft-ietf-mmusic-sdp-srcfilter-10](#) (work in progress), September 2005.
- [9] Yergeau, F., "UTF-8, a transformation format of ISO 10646", [RFC 3629](#), November 2003.
- [10] Berners-Lee, T., Fielding, R., and L. Masinter, "Uniform Resource Identifiers (URI): Generic Syntax", [RFC 2396](#), August 1998.
- [11] Watson, M., "Basic Forward Error Correction (FEC) Schemes", [draft-ietf-rmt-bb-fec-basic-schemes-revised-01](#) (work in progress), October 2005.
- [12] Watson, M., Luby, M., and L. Vicisano, "Forward Error Correction (FEC) Building Block",

Walsh, et al.

Expires July 31, 2006

[Page 26]

Internet-Draft

SDP Descriptors for FLUTE

January 2006

- [draft-ietf-rmt-fec-bb-revised-02](#) (work in progress), October 2005.
- [13] Camarillo, G., Holler, J., Eriksson, G., and H. Schulzrinne, "Grouping of Media Lines in the Session Description Protocol (SDP)", [RFC 3388](#), December 2002.
- [14] Westerlund, M., "A Transport Independent Bandwidth Modifier for the Session Description Protocol (SDP)", [RFC 3890](#), September 2004.

[9.2.](#) Informative References

- [15] Handley, M., Perkins, C., and E. Whelan, "Session Announcement Protocol", [RFC 2974](#), October 2000.
- [16] Rosenberg, J., Schulzrinne, H., Camarillo, G., Johnston, A., Peterson, J., Sparks, R., Handley, M., and E. Schooler, "Session Initiation Protocol", [RFC 3261](#), June 2002.
- [17] Fielding, R., Gettys, J., Mogul, J., Frystyk, H., Masinter, L.,

Leach, P., Berners-Lee, T., and E. Schooler, "Hypertext Transfer Protocol -- HTTP/1.1", [RFC 3261](#), June 2002.

- [18] Yon, D. and G. Camarillo, "TCP-Based Media Transport in the Session Description Protocol (SDP)", [RFC 4145](#), September 1998.
- [19] Holbrook, H. and B. Cain, "Source-Specific Multicast for IP", [draft-ietf-ssm-arch-07](#) (work in progress), October 2005.
- [20] Schulzrinne, H., Rao, A., and R. Lanphier, "Real Time Streaming Protocol (RTSP)", [RFC 2326](#), April 1998.
- [21] "3GPP TS 26.346 V6.3.0 (2005-12), 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs (Release 6)", December 2005.

<Note to RFC Editor: if sdp-new goes to RFC it supersedes references 6 and 7>

<Note to RFC Editor: reference 8 needs correct RFC number when known>

[Appendix A](#). Use of FEC attributes with RTP sessions (informative)

The "FEC-declaration" and "FEC" attributes provide general FEC-OTI information in FEC Encoding ID and FEC Instance ID values. These may also be used for RTP sessions employing same FEC Building Block (as is done for 3GPP MBMS [\[21\]](#)). However semantics of RTP are different from FLUTE (FEC is per session not per object) and RTP does not have in-band mechanism to signal FEC OTI extensions. Thus, RTP FEC declarations are expected to be used for machine configuration as well as capability requirements specification (for FLUTE it is generally only the latter).

Hence the FLUTE SDP, defined in this document, may be extended using a "FEC-OTI-extension" attribute, depending on the configuration needs

of the FEC decoder used and the lack of an alternative means to signal the extended OTI information. The purpose of extended FEC-OTI information define FEC code/instance-specific OTI required for receiver FEC payload configuration. The contents of such an extension would be FEC code- specific and exact specification, beyond adherence to the ABNF below, needs to be specified by any FEC code using this attribute, and hence is outside the scope of this Appendix.

A "FEC-OTI-extension" attribute must be immediately preceded by its associated "FEC-declaration" attribute and so the full FEC-OTI, including extension, will be found in two neighbouring attribute lines. The fec-ref value binds a "FEC-OTI-extension" and "FEC-declaration attribute" pair.

The syntax for the attribute in ABNF is given below:

```
fec-oti-extension-line = "a=FEC-OTI-extension:" fec-ref SP
                        oti-extension CRLF
oti-extension = base64
base64 = *base64-unit [base64-pad]
base64-unit = 4base64-char
base64-pad = 2base64-char "=" / 3base64-char "="
base64-char = ALPHA / DIGIT / "+" / "/"
```

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Acknowledgment

Funding for the RFC Editor function is currently provided by the Internet Society.

