

RMT  
Internet-Draft  
Expires: December 3, 2010

R. Walsh  
I. Curcio  
Nokia Research Center  
J. Peltotalo  
S. Peltotalo  
Tampere University of Technology  
H. Mehta  
June 2010

**SDP Descriptors for FLUTE**  
**draft-mehta-rmt-flute-sdp-06**

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

**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 December 3, 2010.

**Copyright Notice**

Copyright (c) 2010 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

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.

This document may contain material from IETF Documents or IETF Contributions published or made publicly available before November 10, 2008. The person(s) controlling the copyright in some of this material may not have granted the IETF Trust the right to allow modifications of such material outside the IETF Standards Process. Without obtaining an adequate license from the person(s) controlling the copyright in such materials, this document may not be modified outside the IETF Standards Process, and derivative works of it may not be created outside the IETF Standards Process, except to format it for publication as an RFC or to translate it into languages other than English.



## Table of Contents

<a href="#">1.</a>	<a href="#">Introduction . . . . .</a>	<a href="#">4</a>
<a href="#">2.</a>	<a href="#">Conventions Used in This Document . . . . .</a>	<a href="#">5</a>
<a href="#">3.</a>	<a href="#">FLUTE Descriptors . . . . .</a>	<a href="#">6</a>
<a href="#">3.1.</a>	<a href="#">FLUTE Protocol Identifier . . . . .</a>	<a href="#">7</a>
<a href="#">3.2.</a>	<a href="#">Composite Session Semantics . . . . .</a>	<a href="#">8</a>
<a href="#">3.2.1.</a>	<a href="#">Composite Session Semantics for FLUTE Sessions . . . . .</a>	<a href="#">8</a>
<a href="#">3.2.2.</a>	<a href="#">Composite Session Semantics for Protocols other than FLUTE . . . . .</a>	<a href="#">10</a>
<a href="#">3.3.</a>	<a href="#">Source IP Address . . . . .</a>	<a href="#">10</a>
<a href="#">3.4.</a>	<a href="#">Transport Session Identifier . . . . .</a>	<a href="#">11</a>
<a href="#">3.5.</a>	<a href="#">Session Timing Parameters . . . . .</a>	<a href="#">12</a>
<a href="#">3.6.</a>	<a href="#">Channelisation Descriptors . . . . .</a>	<a href="#">12</a>
<a href="#">3.6.1.</a>	<a href="#">Number of Channels . . . . .</a>	<a href="#">12</a>
<a href="#">3.6.2.</a>	<a href="#">Destination IP Address and Port Number for Channels . . . . .</a>	<a href="#">13</a>
<a href="#">3.7.</a>	<a href="#">FEC Object Transmission Information . . . . .</a>	<a href="#">15</a>
<a href="#">3.8.</a>	<a href="#">Content Description Pointer . . . . .</a>	<a href="#">16</a>
<a href="#">3.9.</a>	<a href="#">Bandwidth Specification . . . . .</a>	<a href="#">16</a>
<a href="#">3.9.1.</a>	<a href="#">Bandwidth Specification for Composite Sessions . . . . .</a>	<a href="#">17</a>
<a href="#">3.10.</a>	<a href="#">SDP Specific Parameters . . . . .</a>	<a href="#">17</a>
<a href="#">4.</a>	<a href="#">SDP Syntax Examples . . . . .</a>	<a href="#">18</a>
<a href="#">5.</a>	<a href="#">Security Considerations . . . . .</a>	<a href="#">21</a>
<a href="#">6.</a>	<a href="#">IANA Considerations . . . . .</a>	<a href="#">22</a>
<a href="#">6.1.</a>	<a href="#">Transport Protocol . . . . .</a>	<a href="#">22</a>
<a href="#">6.1.1.</a>	<a href="#">Media formats ("fmt") . . . . .</a>	<a href="#">22</a>
<a href="#">6.2.</a>	<a href="#">Attribute Names . . . . .</a>	<a href="#">22</a>
<a href="#">6.3.</a>	<a href="#">Composite Session Token to Differentiate FLUTE Sessions . . . . .</a>	<a href="#">24</a>
<a href="#">7.</a>	<a href="#">Acknowledgements . . . . .</a>	<a href="#">25</a>
<a href="#">8.</a>	<a href="#">Contributors . . . . .</a>	<a href="#">26</a>
<a href="#">9.</a>	<a href="#">References . . . . .</a>	<a href="#">27</a>
<a href="#">9.1.</a>	<a href="#">Normative References . . . . .</a>	<a href="#">27</a>
<a href="#">9.2.</a>	<a href="#">Informative References . . . . .</a>	<a href="#">28</a>
<a href="#">Appendix A.</a>	<a href="#">Use of FEC attributes with RTP sessions (informative) . . . . .</a>	<a href="#">29</a>
<a href="#">Appendix B.</a>	<a href="#">Further Design Logic for FEC-OTI Descriptors . . . . .</a>	<a href="#">30</a>
	<a href="#">Authors' Addresses . . . . .</a>	<a href="#">31</a>



## **1. Introduction**

The Session Description Protocol (SDP) [[RFC4566](#)] 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 [[RFC3629](#)]) 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 [[I-D.ietf-rmt-flute-revised](#)], SAP [[RFC2974](#)], SIP [[RFC3261](#)], RTSP [[RFC2326](#)], HTTP [[RFC2616](#)], 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. [[RFC4145](#)] defines protocol identifiers for connection-oriented reliable transports: TCP and TCP/TLS.

This document defines a new protocol identifier for File Delivery over Unidirectional Transport (FLUTE) protocol [[I-D.ietf-rmt-flute-revised](#)] and other required SDP attributes for initiating a FLUTE session. The formal ABNF syntax [[RFC5234](#)] 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.

Note, this document may also be used to describe sessions of the experimental FLUTE specification [[RFC3926](#)].



## **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](#) [[RFC2119](#)].

### 3. FLUTE Descriptors

The FLUTE specification [[I-D.ietf-rmt-flute-revised](#)] 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. Listed below are the required and optional SDP parameters for FLUTE sessions (the parameters introduced, or made mandatory, by this specification but not inherited from the FLUTE specification are marked with an asterisk "\*").

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 An indication that the session is a FLUTE session;
- \* The start time and end time of the session.

The optional parameters are:

- 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 Definition and configuration of congestion control mechanism for the session [Editorial note: under consideration];
- o Security parameters relevant for the session [Editorial note: under consideration];
- \* Bandwidth specification.

(Note, best practise to provide parameters for FLUTE's optional content encoding of FDT Instance is in-band within FLUTE session and is therefore not specified using SDP.)

(Note, the out-of-band FEC Object Transmission Information useful for FLUTE sessions is limited to capabilities describing FEC Encoding ID(s) and FEC Instance ID(s) as FLUTE provides header fields for



machine configuration for object reception. This specification also provides a "fec-oti-extension", as an informative appendix, so that the same SDP syntax can be used to describe sessions using protocols other than FLUTE that do not have an in-band mechanism for FEC machine configuration.)

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 stream. (Note, SDP specification [[RFC4566](#)] use of the term media stream is semantically equivalent to the FLUTE specification use of the term channel.) 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 [[RFC5888](#)].

The description of these parameters in SDP is presented in the following sections.

### **3.1. FLUTE Protocol Identifier**

The following is the ABNF syntax for an "m=" line, as specified by [RFC4566](#) [[RFC4566](#)]:

```
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 [[I-D.ietf-rmt-flute-revised](#)] 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. [Editorial note: as part of the



revised FLUTE (FDT schema) version discussion we may consider using fmt values (1 and 2) to describe FLUTE/FDT version number.]

### **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. Subsection 3.2.1. defines the FLUTE/UDP protocol identifier specific semantic.

This mechanism is useful where multiple FLUTE sessions are described as part of a larger service or application, and so where maintaining and delivering session descriptions together (with a shared delivery fate) is good practice. It may also improve bandwidth efficiency by eliminating repetition of redundant descriptors that would be necessary with multiple discrete SDP instances.

The Composite Session mechanism inherits the "group" and "mid" attributes from the SDP grouping framework [RFC5888] and introduces the "CS" (Composite Session) token as a "semantics-extension".

When the Composite Session mechanism is used: the SDP grouping framework [RFC5888] 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. [Editorial note: unless we discover problems with existing implementations, "The first media line declared..." will be changed to: "The first (leftmost) mid value declared..."]

#### **3.2.1. Composite Session Semantics for FLUTE Sessions**

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.

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 identifier (i.e. a FLUTE channel), use of Composite Session semantics is RECOMMENDED.

To support simple applications, as well as ensure harmony with FLUTE SDP standards outside of the IETF [[3GPP.26.346](#)], 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 [[3GPP.26.346](#)]. 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.



### **3.2.2. Composite Session Semantics for Protocols other than FLUTE**

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) [[RFC5775](#)] and the Layered Coding Transport (LCT) [[RFC5651](#)] specifications require that all the channels of a single ALC/LCT session are from the same source IP address. [Editorial note: we believe this text to be correct but have open the question to the mailing group to verify that the single sender is identical to the single 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") [[RFC4570](#)], 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 [[RFC4570](#)].
- 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 * 2001:0DB8:1:2:240:96FF:FE25:8EC9
```

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

### **3.4. Transport Session Identifier**

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. [Editorial note: SDP specification guidance is to expire sessions 30 minutes after the time given in the t-field and as the t-field is mandatory with SDP we are consulting to try and tighten this time requirement for well bounded sessions to something more familiar to the SDP world - "60 minutes" instead of "large time". For unbounded sessions (end time = "0") the amorphous "large time" recommendation will remain in force.] This requirement is inherited from LCT [[RFC5651](#)]. 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=" [[RFC4566](#)] 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 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 [RFC4566], and its 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 [[RFC4566](#)]. The destination port number MUST be defined according to the "port" sub-field of the media description field ("m=") of SDP [[RFC4566](#)].

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 (called "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 of the channels). Whenever destination port number is used to differentiate between FLUTE channels, the same destination IP address MUST be used for all channels in that FLUTE session. Note, 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.

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 FLUTE session - i.e. for a single composite session (when the SDP describes multiple FLUTE sessions) or for a single SDP (when only one FLUTE session is described).

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 FF33::8000:1
```

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 can indicate whether a multicast media belongs to an ASM or a SSM group as described by [\[RFC4607\]](#).

### **3.7. FEC Object Transmission Information**

An SDP description for a FLUTE session MAY include FEC Object Transmission Information (FEC-OTI) [\[RFC5052\]](#). 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 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 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.



These parameters do not mandate a certain machine configuration but instead indicate which capabilities might be needed for successful reception of objects from specific channels. (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.

More complete list of notes on the design logic for the FEC-OTI descriptors is provided as an appendix to this document.

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 [RFC3986].
```

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 [[RFC3890](#)] on media-level, although the AS bandwidth modifier [[RFC4566](#)] 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.

#### **3.10. SDP Specific Parameters**

SDP [[RFC4566](#)] also mandates three parameters ("v=", "o=" and "s=") that would be present in every FLUTE SDP description regardless of their usefulness to the FLUTE session description.



#### 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 2001:0DB8::112E:144A:1E24
s=File delivery session example
i=More information
t=2873397496 2873404696
a=source-filter: incl IN IP6 * 2001:0DB8:1:2:240:96FF:FE25:8EC9
a=flute-tsi:3
a=flute-ch:2
a=FEC-declaration:0 encoding-id=0
a=FEC-declaration:1 encoding-id=129; instance-id=0
a=content-desc:http://www.example.com/flute-sessions/session001
m=application 12345 FLUTE/UDP *
c=IN IP6 FF33::8000:1
a=FEC:0
m=application 12346 FLUTE/UDP *
c=IN IP6 FF33::8000:2
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 \* 2001:0DB8:1:2:240:96FF:FE25:8EC9" describes a source filter. In this example the source indicates that the receiver(s) should include the given IP address (2001:0DB8:1:2:240:96FF: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 2001:0DB8::112E:144A:1E24
s=File delivery session example
i=More information
t=2873397496 2873404696
a=source-filter: incl IN IP6 * 2001:0DB8:1:2:240:96FF:FE25:8EC9
a=flute-tsi:2
a=flute-ch:1
m=application 12345 FLUTE/UDP *
c=IN IP6 FF33::8000:1
a=FEC-declaration:0 encoding-id=129; 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 2001:0DB8::112E:144A:1E24
s=File delivery session example
i=More information
t=2873397496 2873404696
a=source-filter: incl IN IP6 * 2001:0DB8:1:2:240:96FF:FE25:8EC9
a=FEC-declaration:0 encoding-id=0
a=FEC-declaration:1 encoding-id=129; instance-id=0'
a=group:CS 1 2
a=group:CS 3 4
m=application 12345 FLUTE/UDP *
c=IN IP6 FF33::8000:1
a=flute-tsi:1
a=FEC:0
a=mid:1
m=application 12346 FLUTE/UDP *
c=IN IP6 FF33::8000:2
a=mid:2
m=application 12347 FLUTE/UDP *
c=IN IP6 FF33::8000:3
a=flute-tsi:2
a=FEC:1
a=mid:3
m=application 12348 FLUTE/UDP *
c=IN IP6 FF33::8000:4
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 [[RFC4566](#)] for security considerations specific to the Session Description Protocol in general. See also [[RFC4570](#)] for security consideration related to source address filters. [Editorial note: section under review]

## **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 [[I-D.ietf-rmt-flute-revised](#)] 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](#)). [Editorial note: wording of this section is under review pending FLUTE/FDT version discussion.]

### **6.2. Attribute Names**

As recommended by [[RFC4566](#)], 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  
EMail: 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 [[RFC5888](#)]:

Semantics	Token	Reference
-----	-----	-----
Composite Session	CS	This document

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.

## **8. Contributors**

Magnus Westerlund  
Ericsson Research  
Ericsson AB  
SE-164 80 Stockholm  
Sweden  
EMail: Magnus.Westerlund (at) ericsson.com

Joerg Ott  
Aalto University  
Otakaari 5A  
FI-02150 Espoo  
Finland  
EMail: jo (at) netlab.tkk.fi



## **9. References**

### **9.1. Normative References**

- [I-D.ietf-rmt-flute-revised]  
Paila, T., Walsh, R., Luby, M., Roca, V., and R. Lehtonen,  
"FLUTE - File Delivery over Unidirectional Transport",  
[draft-ietf-rmt-flute-revised-11](#) (work in progress),  
March 2010.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate  
Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC5775] Luby, M., Watson, M., and L. Vicisano, "Asynchronous  
Layered Coding (ALC) Protocol Instantiation", [RFC 5775](#),  
April 2010.
- [RFC5651] Luby, M., Watson, M., and L. Vicisano, "Layered Coding  
Transport (LCT) Building Block", [RFC 5651](#), October 2009.
- [RFC5234] Crocker, D. and P. Overell, "Augmented BNF for Syntax  
Specifications: ABNF", STD 68, [RFC 5234](#), January 2008.
- [RFC4566] Handley, M., Jacobson, V., and C. Perkins, "SDP: Session  
Description Protocol", [RFC 4566](#), July 2006.
- [RFC4570] Quinn, B. and R. Finlayson, "Session Description Protocol  
(SDP) Source Filters", [RFC 4570](#), July 2006.
- [RFC3629] Yergeau, F., "UTF-8, a transformation format of ISO  
10646", STD 63, [RFC 3629](#), November 2003.
- [RFC3986] Berners-Lee, T., Fielding, R., and L. Masinter, "Uniform  
Resource Identifier (URI): Generic Syntax", STD 66,  
[RFC 3986](#), January 2005.
- [RFC5445] Watson, M., "Basic Forward Error Correction (FEC)  
Schemes", [RFC 5445](#), March 2009.
- [RFC5052] Watson, M., Luby, M., and L. Vicisano, "Forward Error  
Correction (FEC) Building Block", [RFC 5052](#), August 2007.
- [RFC5888] Camarillo, G. and H. Schulzrinne, "The Session Description  
Protocol (SDP) Grouping Framework", [RFC 5888](#), June 2010.
- [RFC3890] Westerlund, M., "A Transport Independent Bandwidth  
Modifier for the Session Description Protocol (SDP)",  
[RFC 3890](#), September 2004.



## **9.2. Informative References**

- [RFC3926] Paila, T., Luby, M., Lehtonen, R., Roca, V., and R. Walsh, "FLUTE - File Delivery over Unidirectional Transport", [RFC 3926](#), October 2004.
- [RFC2974] Handley, M., Perkins, C., and E. Whelan, "Session Announcement Protocol", [RFC 2974](#), October 2000.
- [RFC3261] Rosenberg, J., Schulzrinne, H., Camarillo, G., Johnston, A., Peterson, J., Sparks, R., Handley, M., and E. Schooler, "SIP: Session Initiation Protocol", [RFC 3261](#), June 2002.
- [RFC2616] Fielding, R., Gettys, J., Mogul, J., Frystyk, H., Masinter, L., Leach, P., and T. Berners-Lee, "Hypertext Transfer Protocol -- HTTP/1.1", [RFC 2616](#), June 1999.
- [RFC4145] Yon, D. and G. Camarillo, "TCP-Based Media Transport in the Session Description Protocol (SDP)", [RFC 4145](#), September 2005.
- [RFC4607] Holbrook, H. and B. Cain, "Source-Specific Multicast for IP", [RFC 4607](#), August 2006.
- [RFC2326] Schulzrinne, H., Rao, A., and R. Lanphier, "Real Time Streaming Protocol (RTSP)", [RFC 2326](#), April 1998.
- [3GPP.26.346]  
3GPP, "Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs", 3GPP TS 26.346 6.13.0, March 2009.



## **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 [[3GPP.26.346](#)]). 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 FEC-OTI information. The purpose of extended FEC-OTI information is to 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 / "+" / "/"
```



## **Appendix B. Further Design Logic for FEC-OTI Descriptors**

There are several 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 [[RFC5445](#)] 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). [Editorial note: [RFC5445](#) is currently under normative section and we believe that it should be under informative section. This needs checking.]
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 mentioned above.

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).



## Authors' Addresses

Rod Walsh  
Nokia Research Center  
P.O. Box 100 (Visiokatu 1)  
Tampere FI-33721  
Finland

Email: rod.walsh (at) nokia.com

Igor D.D. Curcio  
Nokia Research Center  
P.O. Box 88 (Tieteenkatu 1)  
Tampere FI-33721  
Finland

Email: igor.curcio (at) nokia.com

Jani Peltotalo  
Tampere University of Technology  
P.O. Box 553 (Korkeakoulunkatu 1)  
Tampere FI-33101  
Finland

Email: jani.peltotalo (at) tut.fi

Sami Peltotalo  
Tampere University of Technology  
P.O. Box 553 (Korkeakoulunkatu 1)  
Tampere FI-33101  
Finland

Email: sami.peltotalo (at) tut.fi

Harsh Mehta

Email: harsh.mehta (at) gmail.com

