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SDP: Session Description Protocol

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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Abstract

This memo defines the Session Description Protocol (SDP). SDP is intended for describing multimedia sessions for the purposes of session announcement, session invitation, and other forms of multimedia session initiation.

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1. Introduction

When initiating multimedia teleconferences, voice-over-IP calls, streaming video, or other sessions, there is a requirement to convey media details, transport addresses, and other session description metadata to the participants.

SDP provides a standard representation for such information, irrespective of how that information is transported. SDP is purely a format for session description -- it does not incorporate a transport protocol, and it is intended to use different transport protocols as appropriate, including the Session Announcement Protocol [14], Session Initiation Protocol [15], Real Time Streaming Protocol [16], electronic mail using the MIME extensions, and the Hypertext Transport Protocol.

SDP is intended to be general purpose so that it can be used in a wide range of network environments and applications. However, it is not intended to support negotiation of session content or media encodings: this is viewed as outside the scope of session description.

This memo obsoletes RFC 2327 [6] and RFC 3266 [10]. Section 10 outlines the changes introduced in this memo.

2. Glossary of Terms

The following terms are used in this document and have specific meaning within the context of this document.

Conference: A multimedia conference is a set of two or more communicating users along with the software they are using to communicate.

Session: A multimedia session is a set of multimedia senders and receivers and the data streams flowing from senders to receivers. A multimedia conference is an example of a multimedia session.

Session Description: A well-defined format for conveying sufficient information to discover and participate in a multimedia session.

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 [3].

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3. Examples of SDP Usage

3.1. Session Initiation

The Session Initiation Protocol (SIP) [15] is an application-layer control protocol for creating, modifying, and terminating sessions such as Internet multimedia conferences, Internet telephone calls, and multimedia distribution. The SIP messages used to create sessions carry session descriptions that allow participants to agree on a set of compatible media types. These session descriptions are commonly formatted using SDP. When used with SIP, the offer/answer model [17] provides a limited framework for negotiation using SDP.

3.2. Streaming Media

The Real Time Streaming Protocol (RTSP) [16], is an application-level protocol for control over the delivery of data with real-time properties. RTSP provides an extensible framework to enable controlled, on-demand delivery of real-time data, such as audio and video. An RTSP client and server negotiate an appropriate set of parameters for media delivery, partially using SDP syntax to describe those parameters.

3.3. Email and the World Wide Web

Alternative means of conveying session descriptions include electronic mail and the World Wide Web (WWW). For both email and WWW distribution, the media type "application/sdp" is used. This enables the automatic launching of applications for participation in the session from the WWW client or mail reader in a standard manner.

Note that announcements of multicast sessions made only via email or the WWW do not have the property that the receiver of a session announcement can necessarily receive the session because the multicast sessions may be restricted in scope, and access to the WWW server or reception of email is possible outside this scope.

3.4. Multicast Session Announcement

In order to assist the advertisement of multicast multimedia conferences and other multicast sessions, and to communicate the relevant session setup information to prospective participants, a distributed session directory may be used. An instance of such a session directory periodically sends packets containing a description of the session to a well-known multicast group. These advertisements are received by other session directories such that potential remote participants can use the session description to start the tools required to participate in the session.

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One protocol used to implement such a distributed directory is the Session Announcement Protocol (SAP) [14]. SDP provides the recommended session description format for such session announcements.

4. Requirements and Recommendations

The purpose of SDP is to convey information about media streams in multimedia sessions to allow the recipients of a session description to participate in the session. SDP is primarily intended for use in an internetwork, although it is sufficiently general that it can describe conferences in other network environments. Media streams can be many-to-many. Sessions need not be continually active.

Thus far, multicast-based sessions on the Internet have differed from many other forms of conferencing in that anyone receiving the traffic can join the session (unless the session traffic is encrypted). In such an environment, SDP serves two primary purposes. It is a means to communicate the existence of a session, and it is a means to convey sufficient information to enable joining and participating in the session. In a unicast environment, only the latter purpose is likely to be relevant.

An SDP session description includes the following:

- Session name and purpose
- Time(s) the session is active
- The media comprising the session
- Information needed to receive those media (addresses, ports, formats, etc.)

As resources necessary to participate in a session may be limited, some additional information may also be desirable:

- Information about the bandwidth to be used by the session
- Contact information for the person responsible for the session

In general, SDP must convey sufficient information to enable applications to join a session (with the possible exception of encryption keys) and to announce the resources to be used to any non-participants that may need to know. (This latter feature is primarily useful when SDP is used with a multicast session announcement protocol.)

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4.1. Media and Transport Information

An SDP session description includes the following media information:

- o The type of media (video, audio, etc.)
- o The transport protocol (RTP/UDP/IP, H.320, etc.)
- o The format of the media (H.261 video, MPEG video, etc.)

In addition to media format and transport protocol, SDP conveys address and port details. For an IP multicast session, these comprise:

- o The multicast group address for media
- o The transport port for media

This address and port are the destination address and destination port of the multicast stream, whether being sent, received, or both.

For unicast IP sessions, the following are conveyed:

- o The remote address for media
- o The remote transport port for media

The semantics of this address and port depend on the media and transport protocol defined. By default, this SHOULD be the remote address and remote port to which data is sent. Some media types may redefine this behaviour, but this is NOT RECOMMENDED since it complicates implementations (including middleboxes that must parse the addresses to open Network Address Translation (NAT) or firewall pinholes).

4.2. Timing Information

Sessions may be either bounded or unbounded in time. Whether or not they are bounded, they may be only active at specific times. SDP can convey:

- o An arbitrary list of start and stop times bounding the session
- o For each bound, repeat times such as "every Wednesday at 10am for one hour"

This timing information is globally consistent, irrespective of local time zone or daylight saving time (see Section 5.9).

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4.3. Private Sessions

It is possible to create both public sessions and private sessions. SDP itself does not distinguish between these; private sessions are typically conveyed by encrypting the session description during distribution. The details of how encryption is performed are dependent on the mechanism used to convey SDP; mechanisms are currently defined for SDP transported using SAP [14] and SIP [15], and others may be defined in the future.

If a session announcement is private, it is possible to use that private announcement to convey encryption keys necessary to decode each of the media in a conference, including enough information to know which encryption scheme is used for each media.

4.4. Obtaining Further Information about a Session

A session description should convey enough information to decide whether or not to participate in a session. SDP may include additional pointers in the form of Uniform Resource Identifiers (URIs) for more information about the session.

4.5. Categorisation

When many session descriptions are being distributed by SAP, or any other advertisement mechanism, it may be desirable to filter session announcements that are of interest from those that are not. SDP supports a categorisation mechanism for sessions that is capable of being automated (the "a=cat:" attribute; see Section 6).

4.6. Internationalisation

The SDP specification recommends the use of the ISO 10646 character sets in the UTF-8 encoding [5] to allow many different languages to be represented. However, to assist in compact representations, SDP also allows other character sets such as ISO 8859-1 to be used when desired. Internationalisation only applies to free-text fields (session name and background information), and not to SDP as a whole.

5. SDP Specification

An SDP session description is denoted by the media type "application/sdp" (See Section 8).

An SDP session description is entirely textual using the ISO 10646 character set in UTF-8 encoding. SDP field names and attribute names use only the US-ASCII subset of UTF-8, but textual fields and attribute values MAY use the full ISO 10646 character set. Field and

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attribute values that use the full UTF-8 character set are never directly compared, hence there is no requirement for UTF-8 normalisation. The textual form, as opposed to a binary encoding such as ASN.1 or XDR, was chosen to enhance portability, to enable a variety of transports to be used, and to allow flexible, text-based toolkits to be used to generate and process session descriptions. However, since SDP may be used in environments where the maximum permissible size of a session description is limited, the encoding is deliberately compact. Also, since announcements may be transported via very unreliable means or damaged by an intermediate caching server, the encoding was designed with strict order and formatting rules so that most errors would result in malformed session announcements that could be detected easily and discarded. This also allows rapid discarding of encrypted session announcements for which a receiver does not have the correct key.

An SDP session description consists of a number of lines of text of the form:

```
<type>=<value>
```

where <type> MUST be exactly one case-significant character and <value> is structured text whose format depends on <type>. In general, <value> is either a number of fields delimited by a single space character or a free format string, and is case-significant unless a specific field defines otherwise. Whitespace MUST NOT be used on either side of the "=" sign.

An SDP session description consists of a session-level section followed by zero or more media-level sections. The session-level part starts with a "v=" line and continues to the first media-level section. Each media-level section starts with an "m=" line and continues to the next media-level section or end of the whole session description. In general, session-level values are the default for all media unless overridden by an equivalent media-level value.

Some lines in each description are REQUIRED and some are OPTIONAL, but all MUST appear in exactly the order given here (the fixed order greatly enhances error detection and allows for a simple parser). OPTIONAL items are marked with a "*".

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```
Session description
   v=  (protocol version)
   o=  (originator and session identifier)
   s=  (session name)
   i=* (session information)
   u=* (URI of description)
   e=* (email address)
   p=* (phone number)
   c=* (connection information -- not required if included in
        all media)
   b=* (zero or more bandwidth information lines)
   One or more time descriptions ("t=" and "r=" lines; see below)
   z=* (time zone adjustments)
   k=* (encryption key)
   a=* (zero or more session attribute lines)
   Zero or more media descriptions

Time description
   t=  (time the session is active)
   r=* (zero or more repeat times)

Media description, if present
   m=  (media name and transport address)
   i=* (media title)
   c=* (connection information -- optional if included at
        session level)
   b=* (zero or more bandwidth information lines)
   k=* (encryption key)
   a=* (zero or more media attribute lines)
```

The set of type letters is deliberately small and not intended to be extensible -- an SDP parser MUST completely ignore any session description that contains a type letter that it does not understand. The attribute mechanism ("a=" described below) is the primary means for extending SDP and tailoring it to particular applications or media. Some attributes (the ones listed in Section 6 of this memo) have a defined meaning, but others may be added on an application-, media-, or session-specific basis. An SDP parser MUST ignore any attribute it doesn’t understand.

An SDP session description may contain URIs that reference external content in the "u=", "k=", and "a=" lines. These URIs may be dereferenced in some cases, making the session description non-self-contained.

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The connection ("c=") and attribute ("a=") information in the session-level section applies to all the media of that session unless overridden by connection information or an attribute of the same name in the media description. For instance, in the example below, each media behaves as if it were given a "recvonly" attribute.

An example SDP description is:

```
v=0
o=jdoe 2890844526 2890842807 IN IP4 10.47.16.5
s=SDP Seminar
i=A Seminar on the session description protocol
u=http://www.example.com/seminars/sdp.pdf
e=j.doe@example.com (Jane Doe)
c=IN IP4 224.2.17.12/127
t=2873397496 2873404696
a=recvonly
m=audio 49170 RTP/AVP 0
m=video 51372 RTP/AVP 99
a=rtpmap:99 h263-1998/90000
```

Text fields such as the session name and information are octet strings that may contain any octet with the exceptions of 0x00 (Nul), 0x0a (ASCII newline), and 0x0d (ASCII carriage return). The sequence CRLF (0x0d0a) is used to end a record, although parsers SHOULD be tolerant and also accept records terminated with a single newline character. If the "a=charset" attribute is not present, these octet strings MUST be interpreted as containing ISO-10646 characters in UTF-8 encoding (the presence of the "a=charset" attribute may force some fields to be interpreted differently).

A session description can contain domain names in the "o=", "u=", "e=", "c=", and "a=" lines. Any domain name used in SDP MUST comply with [1], [2]. Internationalised domain names (IDNs) MUST be represented using the ASCII Compatible Encoding (ACE) form defined in [11] and MUST NOT be directly represented in UTF-8 or any other encoding (this requirement is for compatibility with RFC 2327 and other SDP-related standards, which predate the development of internationalised domain names).

5.1. Protocol Version ("v=")

```
v=0
```

The "v=" field gives the version of the Session Description Protocol. This memo defines version 0. There is no minor version number.

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5.2. Origin ("o=")

```
o=<username> <sess-id> <sess-version> <nettype> <addrtype>
  <unicast-address>
```

The "o=" field gives the originator of the session (her username and the address of the user's host) plus a session identifier and version number:

<username> is the user's login on the originating host, or it is "-" if the originating host does not support the concept of user IDs. The <username> MUST NOT contain spaces.

<sess-id> is a numeric string such that the tuple of <username>, <sess-id>, <nettype>, <addrtype>, and <unicast-address> forms a globally unique identifier for the session. The method of <sess-id> allocation is up to the creating tool, but it has been suggested that a Network Time Protocol (NTP) format timestamp be used to ensure uniqueness [13].

<sess-version> is a version number for this session description. Its usage is up to the creating tool, so long as <sess-version> is increased when a modification is made to the session data. Again, it is RECOMMENDED that an NTP format timestamp is used.

<nettype> is a text string giving the type of network. Initially "IN" is defined to have the meaning "Internet", but other values MAY be registered in the future (see Section 8).

<addrtype> is a text string giving the type of the address that follows. Initially "IP4" and "IP6" are defined, but other values MAY be registered in the future (see Section 8).

<unicast-address> is the address of the machine from which the session was created. For an address type of IP4, this is either the fully qualified domain name of the machine or the dotted-decimal representation of the IP version 4 address of the machine. For an address type of IP6, this is either the fully qualified domain name of the machine or the compressed textual representation of the IP version 6 address of the machine. For both IP4 and IP6, the fully qualified domain name is the form that SHOULD be given unless this is unavailable, in which case the globally unique address MAY be substituted. A local IP address MUST NOT be used in any context where the SDP description might leave the scope in which the address is meaningful (for example, a local address MUST NOT be included in an application-level referral that might leave the scope).

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In general, the "o=" field serves as a globally unique identifier for this version of this session description, and the subfields excepting the version taken together identify the session irrespective of any modifications.

For privacy reasons, it is sometimes desirable to obfuscate the username and IP address of the session originator. If this is a concern, an arbitrary <username> and private <unicast-address> MAY be chosen to populate the "o=" field, provided that these are selected in a manner that does not affect the global uniqueness of the field.

5.3. Session Name ("s=")

```
s=<session name>
```

The "s=" field is the textual session name. There MUST be one and only one "s=" field per session description. The "s=" field MUST NOT be empty and SHOULD contain ISO 10646 characters (but see also the "a=charset" attribute). If a session has no meaningful name, the value "s= " SHOULD be used (i.e., a single space as the session name).

5.4. Session Information ("i=")

```
i=<session description>
```

The "i=" field provides textual information about the session. There MUST be at most one session-level "i=" field per session description, and at most one "i=" field per media. If the "a=charset" attribute is present, it specifies the character set used in the "i=" field. If the "a=charset" attribute is not present, the "i=" field MUST contain ISO 10646 characters in UTF-8 encoding.

A single "i=" field MAY also be used for each media definition. In media definitions, "i=" fields are primarily intended for labelling media streams. As such, they are most likely to be useful when a single session has more than one distinct media stream of the same media type. An example would be two different whiteboards, one for slides and one for feedback and questions.

The "i=" field is intended to provide a free-form human-readable description of the session or the purpose of a media stream. It is not suitable for parsing by automata.

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5.5. URI ("u=")

```
u=<uri>
```

A URI is a Uniform Resource Identifier as used by WWW clients [7]. The URI should be a pointer to additional information about the session. This field is OPTIONAL, but if it is present it MUST be specified before the first media field. No more than one URI field is allowed per session description.

5.6. Email Address and Phone Number ("e=" and "p=")

```
e=<email-address>
p=<phone-number>
```

The "e=" and "p=" lines specify contact information for the person responsible for the conference. This is not necessarily the same person that created the conference announcement.

Inclusion of an email address or phone number is OPTIONAL. Note that the previous version of SDP specified that either an email field or a phone field MUST be specified, but this was widely ignored. The change brings the specification into line with common usage.

If an email address or phone number is present, it MUST be specified before the first media field. More than one email or phone field can be given for a session description.

Phone numbers SHOULD be given in the form of an international public telecommunication number (see ITU-T Recommendation E.164) preceded by a "+". Spaces and hyphens may be used to split up a phone field to aid readability if desired. For example:

```
p=+1 617 555-6011
```

Both email addresses and phone numbers can have an OPTIONAL free text string associated with them, normally giving the name of the person who may be contacted. This MUST be enclosed in parentheses if it is present. For example:

```
e=j.doe@example.com (Jane Doe)
```

The alternative RFC 2822 [29] name quoting convention is also allowed for both email addresses and phone numbers. For example:

```
e=Jane Doe <j.doe@example.com>
```


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The free text string SHOULD be in the ISO-10646 character set with UTF-8 encoding, or alternatively in ISO-8859-1 or other encodings if the appropriate session-level "a=charset" attribute is set.

5.7. Connection Data ("c=")

```
c=<nettype> <addrtype> <connection-address>
```

The "c=" field contains connection data.

A session description MUST contain either at least one "c=" field in each media description or a single "c=" field at the session level. It MAY contain a single session-level "c=" field and additional "c=" field(s) per media description, in which case the per-media values override the session-level settings for the respective media.

The first sub-field ("<nettype>") is the network type, which is a text string giving the type of network. Initially, "IN" is defined to have the meaning "Internet", but other values MAY be registered in the future (see Section 8).

The second sub-field ("<addrtype>") is the address type. This allows SDP to be used for sessions that are not IP based. This memo only defines IP4 and IP6, but other values MAY be registered in the future (see Section 8).

The third sub-field ("<connection-address>") is the connection address. OPTIONAL sub-fields MAY be added after the connection address depending on the value of the <addrtype> field.

When the <addrtype> is IP4 and IP6, the connection address is defined as follows:

- o If the session is multicast, the connection address will be an IP multicast group address. If the session is not multicast, then the connection address contains the unicast IP address of the expected data source or data relay or data sink as determined by additional attribute fields. It is not expected that unicast addresses will be given in a session description that is communicated by a multicast announcement, though this is not prohibited.

- o Sessions using an IPv4 multicast connection address MUST also have a time to live (TTL) value present in addition to the multicast address. The TTL and the address together define the scope with which multicast packets sent in this conference will be sent. TTL values MUST be in the range 0-255. Although the TTL MUST be specified, its use to scope multicast traffic is deprecated;

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applications SHOULD use an administratively scoped address instead.

The TTL for the session is appended to the address using a slash as a separator. An example is:

```
c=IN IP4 224.2.36.42/127
```

IPv6 multicast does not use TTL scoping, and hence the TTL value MUST NOT be present for IPv6 multicast. It is expected that IPv6 scoped addresses will be used to limit the scope of conferences.

Hierarchical or layered encoding schemes are data streams where the encoding from a single media source is split into a number of layers. The receiver can choose the desired quality (and hence bandwidth) by only subscribing to a subset of these layers. Such layered encodings are normally transmitted in multiple multicast groups to allow multicast pruning. This technique keeps unwanted traffic from sites only requiring certain levels of the hierarchy. For applications requiring multiple multicast groups, we allow the following notation to be used for the connection address:

```
<base multicast address>[/<ttl>]/<number of addresses>
```

If the number of addresses is not given, it is assumed to be one. Multicast addresses so assigned are contiguously allocated above the base address, so that, for example:

```
c=IN IP4 224.2.1.1/127/3
```

would state that addresses 224.2.1.1, 224.2.1.2, and 224.2.1.3 are to be used at a TTL of 127. This is semantically identical to including multiple "c=" lines in a media description:

```
c=IN IP4 224.2.1.1/127
c=IN IP4 224.2.1.2/127
c=IN IP4 224.2.1.3/127
```

Similarly, an IPv6 example would be:

```
c=IN IP6 FF15::101/3
```

which is semantically equivalent to:

```
c=IN IP6 FF15::101
c=IN IP6 FF15::102
c=IN IP6 FF15::103
```


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(remembering that the TTL field is not present in IPv6 multicast).

Multiple addresses or "c=" lines MAY be specified on a per-media basis only if they provide multicast addresses for different layers in a hierarchical or layered encoding scheme. They MUST NOT be specified for a session-level "c=" field.

The slash notation for multiple addresses described above MUST NOT be used for IP unicast addresses.

5.8. Bandwidth ("b=")

```
b=<bwtype>:<bandwidth>
```

This OPTIONAL field denotes the proposed bandwidth to be used by the session or media. The <bwtype> is an alphanumeric modifier giving the meaning of the <bandwidth> figure. Two values are defined in this specification, but other values MAY be registered in the future (see Section 8 and [21], [25]):

CT If the bandwidth of a session or media in a session is different from the bandwidth implicit from the scope, a "b=CT:..." line SHOULD be supplied for the session giving the proposed upper limit to the bandwidth used (the "conference total" bandwidth). The primary purpose of this is to give an approximate idea as to whether two or more sessions can coexist simultaneously. When using the CT modifier with RTP, if several RTP sessions are part of the conference, the conference total refers to total bandwidth of all RTP sessions.

AS The bandwidth is interpreted to be application specific (it will be the application’s concept of maximum bandwidth). Normally, this will coincide with what is set on the application’s "maximum bandwidth" control if applicable. For RTP-based applications, AS gives the RTP "session bandwidth" as defined in Section 6.2 of [19].

Note that CT gives a total bandwidth figure for all the media at all sites. AS gives a bandwidth figure for a single media at a single site, although there may be many sites sending simultaneously.

A prefix "X-" is defined for <bwtype> names. This is intended for experimental purposes only. For example:

```
b=X-YZ:128
```


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Use of the "X-" prefix is NOT RECOMMENDED: instead new modifiers SHOULD be registered with IANA in the standard namespace. SDP parsers MUST ignore bandwidth fields with unknown modifiers. Modifiers MUST be alphanumeric and, although no length limit is given, it is recommended that they be short.

The <bandwidth> is interpreted as kilobits per second by default. The definition of a new <bwtype> modifier MAY specify that the bandwidth is to be interpreted in some alternative unit (the "CT" and "AS" modifiers defined in this memo use the default units).

5.9. Timing ("t=")

```
t=<start-time> <stop-time>
```

The "t=" lines specify the start and stop times for a session. Multiple "t=" lines MAY be used if a session is active at multiple irregularly spaced times; each additional "t=" line specifies an additional period of time for which the session will be active. If the session is active at regular times, an "r=" line (see below) should be used in addition to, and following, a "t=" line -- in which case the "t=" line specifies the start and stop times of the repeat sequence.

The first and second sub-fields give the start and stop times, respectively, for the session. These values are the decimal representation of Network Time Protocol (NTP) time values in seconds since 1900 [13]. To convert these values to UNIX time, subtract decimal 2208988800.

NTP timestamps are elsewhere represented by 64-bit values, which wrap sometime in the year 2036. Since SDP uses an arbitrary length decimal representation, this should not cause an issue (SDP timestamps MUST continue counting seconds since 1900, NTP will use the value modulo the 64-bit limit).

If the <stop-time> is set to zero, then the session is not bounded, though it will not become active until after the <start-time>. If the <start-time> is also zero, the session is regarded as permanent.

User interfaces SHOULD strongly discourage the creation of unbounded and permanent sessions as they give no information about when the session is actually going to terminate, and so make scheduling difficult.

The general assumption may be made, when displaying unbounded sessions that have not timed out to the user, that an unbounded session will only be active until half an hour from the current time

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or the session start time, whichever is the later. If behaviour other than this is required, an end-time SHOULD be given and modified as appropriate when new information becomes available about when the session should really end.

Permanent sessions may be shown to the user as never being active unless there are associated repeat times that state precisely when the session will be active.

5.10. Repeat Times ("r=")

```
r=<repeat interval> <active duration> <offsets from start-time>
```

"r=" fields specify repeat times for a session. For example, if a session is active at 10am on Monday and 11am on Tuesday for one hour each week for three months, then the <start-time> in the corresponding "t=" field would be the NTP representation of 10am on the first Monday, the <repeat interval> would be 1 week, the <active duration> would be 1 hour, and the offsets would be zero and 25 hours. The corresponding "t=" field stop time would be the NTP representation of the end of the last session three months later. By default, all fields are in seconds, so the "r=" and "t=" fields might be the following:

```
t=3034423619 3042462419
r=604800 3600 0 90000
```

To make description more compact, times may also be given in units of days, hours, or minutes. The syntax for these is a number immediately followed by a single case-sensitive character. Fractional units are not allowed -- a smaller unit should be used instead. The following unit specification characters are allowed:

```
d - days (86400 seconds)
h - hours (3600 seconds)
m - minutes (60 seconds)
s - seconds (allowed for completeness)
```

Thus, the above session announcement could also have been written:

```
r=7d 1h 0 25h
```

Monthly and yearly repeats cannot be directly specified with a single SDP repeat time; instead, separate "t=" fields should be used to explicitly list the session times.

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5.11. Time Zones ("z=")

```
z=<adjustment time> <offset> <adjustment time> <offset> ....
```

To schedule a repeated session that spans a change from daylight saving time to standard time or vice versa, it is necessary to specify offsets from the base time. This is required because different time zones change time at different times of day, different countries change to or from daylight saving time on different dates, and some countries do not have daylight saving time at all.

Thus, in order to schedule a session that is at the same time winter and summer, it must be possible to specify unambiguously by whose time zone a session is scheduled. To simplify this task for receivers, we allow the sender to specify the NTP time that a time zone adjustment happens and the offset from the time when the session was first scheduled. The "z=" field allows the sender to specify a list of these adjustment times and offsets from the base time.

An example might be the following:

```
z=2882844526 -1h 2898848070 0
```

This specifies that at time 2882844526, the time base by which the session’s repeat times are calculated is shifted back by 1 hour, and that at time 2898848070, the session’s original time base is restored. Adjustments are always relative to the specified start time -- they are not cumulative. Adjustments apply to all "t=" and "r=" lines in a session description.

If a session is likely to last several years, it is expected that the session announcement will be modified periodically rather than transmit several years’ worth of adjustments in one session announcement.

5.12. Encryption Keys ("k=")

```
k=<method>
k=<method>:<encryption key>
```

If transported over a secure and trusted channel, the Session Description Protocol MAY be used to convey encryption keys. A simple mechanism for key exchange is provided by the key field ("k="), although this is primarily supported for compatibility with older implementations and its use is NOT RECOMMENDED. Work is in progress to define new key exchange mechanisms for use with SDP [27] [28], and it is expected that new applications will use those mechanisms.

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A key field is permitted before the first media entry (in which case it applies to all media in the session), or for each media entry as required. The format of keys and their usage are outside the scope of this document, and the key field provides no way to indicate the encryption algorithm to be used, key type, or other information about the key: this is assumed to be provided by the higher-level protocol using SDP. If there is a need to convey this information within SDP, the extensions mentioned previously SHOULD be used. Many security protocols require two keys: one for confidentiality, another for integrity. This specification does not support transfer of two keys.

The method indicates the mechanism to be used to obtain a usable key by external means, or from the encoded encryption key given. The following methods are defined:

k=clear:<encryption key>

The encryption key is included untransformed in this key field. This method MUST NOT be used unless it can be guaranteed that the SDP is conveyed over a secure channel. The encryption key is interpreted as text according to the charset attribute; use the "k=base64:" method to convey characters that are otherwise prohibited in SDP.

k=base64:<encoded encryption key>

The encryption key is included in this key field but has been base64 encoded [12] because it includes characters that are prohibited in SDP. This method MUST NOT be used unless it can be guaranteed that the SDP is conveyed over a secure channel.

k=uri:<URI to obtain key>

A Uniform Resource Identifier is included in the key field. The URI refers to the data containing the key, and may require additional authentication before the key can be returned. When a request is made to the given URI, the reply should specify the encoding for the key. The URI is often an Secure Socket Layer/Transport Layer Security (SSL/TLS)-protected HTTP URI ("https:"), although this is not required.

k=prompt

No key is included in this SDP description, but the session or media stream referred to by this key field is encrypted. The user should be prompted for the key when attempting to join the session, and this user-supplied key should then be used to

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decrypt the media streams. The use of user-specified keys is NOT RECOMMENDED, since such keys tend to have weak security properties.

The key field MUST NOT be used unless it can be guaranteed that the SDP is conveyed over a secure and trusted channel. An example of such a channel might be SDP embedded inside an S/MIME message or a TLS-protected HTTP session. It is important to ensure that the secure channel is with the party that is authorised to join the session, not an intermediary: if a caching proxy server is used, it is important to ensure that the proxy is either trusted or unable to access the SDP.

5.13. Attributes ("a=")

```
a=<attribute>
a=<attribute>:<value>
```

Attributes are the primary means for extending SDP. Attributes may be defined to be used as "session-level" attributes, "media-level" attributes, or both.

A media description may have any number of attributes ("a=" fields) that are media specific. These are referred to as "media-level" attributes and add information about the media stream. Attribute fields can also be added before the first media field; these "session-level" attributes convey additional information that applies to the conference as a whole rather than to individual media.

Attribute fields may be of two forms:

- o A property attribute is simply of the form "a=<flag>". These are binary attributes, and the presence of the attribute conveys that the attribute is a property of the session. An example might be "a=recvonly".

- o A value attribute is of the form "a=<attribute>:<value>". For example, a whiteboard could have the value attribute "a=orient: landscape"

Attribute interpretation depends on the media tool being invoked. Thus receivers of session descriptions should be configurable in their interpretation of session descriptions in general and of attributes in particular.

Attribute names MUST use the US-ASCII subset of ISO-10646/UTF-8.

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Attribute values are octet strings, and MAY use any octet value except 0x00 (Nul), 0x0A (LF), and 0x0D (CR). By default, attribute values are to be interpreted as in ISO-10646 character set with UTF-8 encoding. Unlike other text fields, attribute values are NOT normally affected by the "charset" attribute as this would make comparisons against known values problematic. However, when an attribute is defined, it can be defined to be charset dependent, in which case its value should be interpreted in the session charset rather than in ISO-10646.

Attributes MUST be registered with IANA (see Section 8). If an attribute is received that is not understood, it MUST be ignored by the receiver.

5.14. Media Descriptions ("m=")

```
m=<media> <port> <proto> <fmt> ...
```

A session description may contain a number of media descriptions. Each media description starts with an "m=" field and is terminated by either the next "m=" field or by the end of the session description. A media field has several sub-fields:

<media> is the media type. Currently defined media are "audio", "video", "text", "application", and "message", although this list may be extended in the future (see Section 8).

<port> is the transport port to which the media stream is sent. The meaning of the transport port depends on the network being used as specified in the relevant "c=" field, and on the transport protocol defined in the <proto> sub-field of the media field. Other ports used by the media application (such as the RTP Control Protocol (RTCP) port [19]) MAY be derived algorithmically from the base media port or MAY be specified in a separate attribute (for example, "a=rtcp:" as defined in [22]).

If non-contiguous ports are used or if they don’t follow the parity rule of even RTP ports and odd RTCP ports, the "a=rtcp:" attribute MUST be used. Applications that are requested to send media to a <port> that is odd and where the "a=rtcp:" is present MUST NOT subtract 1 from the RTP port: that is, they MUST send the RTP to the port indicated in <port> and send the RTCP to the port indicated in the "a=rtcp" attribute.

For applications where hierarchically encoded streams are being sent to a unicast address, it may be necessary to specify multiple transport ports. This is done using a similar notation to that used for IP multicast addresses in the "c=" field:

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```
m=<media> <port>/<number of ports> <proto> <fmt> ...
```

In such a case, the ports used depend on the transport protocol. For RTP, the default is that only the even-numbered ports are used for data with the corresponding one-higher odd ports used for the RTCP belonging to the RTP session, and the <number of ports> denoting the number of RTP sessions. For example:

```
m=video 49170/2 RTP/AVP 31
```

would specify that ports 49170 and 49171 form one RTP/RTCP pair and 49172 and 49173 form the second RTP/RTCP pair. RTP/AVP is the transport protocol and 31 is the format (see below). If non-contiguous ports are required, they must be signalled using a separate attribute (for example, "a=rtcp:" as defined in [22]).

If multiple addresses are specified in the "c=" field and multiple ports are specified in the "m=" field, a one-to-one mapping from port to the corresponding address is implied. For example:

```
c=IN IP4 224.2.1.1/127/2
m=video 49170/2 RTP/AVP 31
```

would imply that address 224.2.1.1 is used with ports 49170 and 49171, and address 224.2.1.2 is used with ports 49172 and 49173.

The semantics of multiple "m=" lines using the same transport address are undefined. This implies that, unlike limited past practice, there is no implicit grouping defined by such means and an explicit grouping framework (for example, [18]) should instead be used to express the intended semantics.

<proto> is the transport protocol. The meaning of the transport protocol is dependent on the address type field in the relevant "c=" field. Thus a "c=" field of IP4 indicates that the transport protocol runs over IP4. The following transport protocols are defined, but may be extended through registration of new protocols with IANA (see Section 8):

* udp: denotes an unspecified protocol running over UDP.

* RTP/AVP: denotes RTP [19] used under the RTP Profile for Audio and Video Conferences with Minimal Control [20] running over UDP.

* RTP/SAVP: denotes the Secure Real-time Transport Protocol [23] running over UDP.

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The main reason to specify the transport protocol in addition to the media format is that the same standard media formats may be carried over different transport protocols even when the network protocol is the same -- a historical example is vat Pulse Code Modulation (PCM) audio and RTP PCM audio; another might be TCP/RTP PCM audio. In addition, relays and monitoring tools that are transport-protocol-specific but format-independent are possible.

<fmt> is a media format description. The fourth and any subsequent sub-fields describe the format of the media. The interpretation of the media format depends on the value of the <proto> sub-field.

If the <proto> sub-field is "RTP/AVP" or "RTP/SAVP" the <fmt> sub-fields contain RTP payload type numbers. When a list of payload type numbers is given, this implies that all of these payload formats MAY be used in the session, but the first of these formats SHOULD be used as the default format for the session. For dynamic payload type assignments the "a=rtpmap:" attribute (see Section 6) SHOULD be used to map from an RTP payload type number to a media encoding name that identifies the payload format. The "a=fmtp:" attribute MAY be used to specify format parameters (see Section 6).

If the <proto> sub-field is "udp" the <fmt> sub-fields MUST reference a media type describing the format under the "audio", "video", "text", "application", or "message" top-level media types. The media type registration SHOULD define the packet format for use with UDP transport.

For media using other transport protocols, the <fmt> field is protocol specific. Rules for interpretation of the <fmt> sub-field MUST be defined when registering new protocols (see Section 8.2.2).

6. SDP Attributes

The following attributes are defined. Since application writers may add new attributes as they are required, this list is not exhaustive. Registration procedures for new attributes are defined in Section 8.2.4.

a=cat:<category>

This attribute gives the dot-separated hierarchical category of the session. This is to enable a receiver to filter unwanted sessions by category. There is no central registry of categories. It is a session-level attribute, and it is not dependent on charset.

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a=keywds:<keywords>

Like the cat attribute, this is to assist identifying wanted sessions at the receiver. This allows a receiver to select interesting session based on keywords describing the purpose of the session; there is no central registry of keywords. It is a session-level attribute. It is a charset-dependent attribute, meaning that its value should be interpreted in the charset specified for the session description if one is specified, or by default in ISO 10646/UTF-8.

a=tool:<name and version of tool>

This gives the name and version number of the tool used to create the session description. It is a session-level attribute, and it is not dependent on charset.

a=ptime:<packet time>

This gives the length of time in milliseconds represented by the media in a packet. This is probably only meaningful for audio data, but may be used with other media types if it makes sense. It should not be necessary to know ptime to decode RTP or vat audio, and it is intended as a recommendation for the encoding/packetisation of audio. It is a media-level attribute, and it is not dependent on charset.

a=maxptime:<maximum packet time>

This gives the maximum amount of media that can be encapsulated in each packet, expressed as time in milliseconds. The time SHALL be calculated as the sum of the time the media present in the packet represents. For frame-based codecs, the time SHOULD be an integer multiple of the frame size. This attribute is probably only meaningful for audio data, but may be used with other media types if it makes sense. It is a media-level attribute, and it is not dependent on charset. Note that this attribute was introduced after RFC 2327, and non-updated implementations will ignore this attribute.

a=rtpmap:<payload type> <encoding name>/<clock rate> [/<encoding parameters>]

This attribute maps from an RTP payload type number (as used in an "m=" line) to an encoding name denoting the payload format to be used. It also provides information on the clock rate and encoding parameters. It is a media-level attribute that is not dependent on charset.

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Although an RTP profile may make static assignments of payload type numbers to payload formats, it is more common for that assignment to be done dynamically using "a=rtpmap:" attributes. As an example of a static payload type, consider u-law PCM coded single-channel audio sampled at 8 kHz. This is completely defined in the RTP Audio/Video profile as payload type 0, so there is no need for an "a=rtpmap:" attribute, and the media for such a stream sent to UDP port 49232 can be specified as:

```
m=audio 49232 RTP/AVP 0
```

An example of a dynamic payload type is 16-bit linear encoded stereo audio sampled at 16 kHz. If we wish to use the dynamic RTP/AVP payload type 98 for this stream, additional information is required to decode it:

```
m=audio 49232 RTP/AVP 98
a=rtpmap:98 L16/16000/2
```

Up to one rtpmap attribute can be defined for each media format specified. Thus, we might have the following:

```
m=audio 49230 RTP/AVP 96 97 98
a=rtpmap:96 L8/8000
a=rtpmap:97 L16/8000
a=rtpmap:98 L16/11025/2
```

RTP profiles that specify the use of dynamic payload types MUST define the set of valid encoding names and/or a means to register encoding names if that profile is to be used with SDP. The "RTP/AVP" and "RTP/SAVP" profiles use media subtypes for encoding names, under the top-level media type denoted in the "m=" line. In the example above, the media types are "audio/l8" and "audio/l16".

For audio streams, <encoding parameters> indicates the number of audio channels. This parameter is OPTIONAL and may be omitted if the number of channels is one, provided that no additional parameters are needed.

For video streams, no encoding parameters are currently specified.

Additional encoding parameters MAY be defined in the future, but codec-specific parameters SHOULD NOT be added. Parameters added to an "a=rtpmap:" attribute SHOULD only be those required for a session directory to make the choice of appropriate media

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to participate in a session. Codec-specific parameters should be added in other attributes (for example, "a=fmtp:").

Note: RTP audio formats typically do not include information about the number of samples per packet. If a non-default (as defined in the RTP Audio/Video Profile) packetisation is required, the "ptime" attribute is used as given above.

a=recvonly

This specifies that the tools should be started in receive-only mode where applicable. It can be either a session- or media-level attribute, and it is not dependent on charset. Note that recvonly applies to the media only, not to any associated control protocol (e.g., an RTP-based system in recvonly mode SHOULD still send RTCP packets).

a=sendrecv

This specifies that the tools should be started in send and receive mode. This is necessary for interactive conferences with tools that default to receive-only mode. It can be either a session or media-level attribute, and it is not dependent on charset.

If none of the attributes "sendonly", "recvonly", "inactive", and "sendrecv" is present, "sendrecv" SHOULD be assumed as the default for sessions that are not of the conference type "broadcast" or "H332" (see below).

a=sendonly

This specifies that the tools should be started in send-only mode. An example may be where a different unicast address is to be used for a traffic destination than for a traffic source. In such a case, two media descriptions may be used, one sendonly and one recvonly. It can be either a session- or media-level attribute, but would normally only be used as a media attribute. It is not dependent on charset. Note that sendonly applies only to the media, and any associated control protocol (e.g., RTCP) SHOULD still be received and processed as normal.

a=inactive

This specifies that the tools should be started in inactive mode. This is necessary for interactive conferences where users can put other users on hold. No media is sent over an

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inactive media stream. Note that an RTP-based system SHOULD still send RTCP, even if started inactive. It can be either a session or media-level attribute, and it is not dependent on charset.

a=orient:<orientation>

Normally this is only used for a whiteboard or presentation tool. It specifies the orientation of a the workspace on the screen. It is a media-level attribute. Permitted values are "portrait", "landscape", and "seascape" (upside-down landscape). It is not dependent on charset.

a=type:<conference type>

This specifies the type of the conference. Suggested values are "broadcast", "meeting", "moderated", "test", and "H332". "recvonly" should be the default for "type:broadcast" sessions, "type:meeting" should imply "sendrecv", and "type:moderated" should indicate the use of a floor control tool and that the media tools are started so as to mute new sites joining the conference.

Specifying the attribute "type:H332" indicates that this loosely coupled session is part of an H.332 session as defined in the ITU H.332 specification [26]. Media tools should be started "recvonly".

Specifying the attribute "type:test" is suggested as a hint that, unless explicitly requested otherwise, receivers can safely avoid displaying this session description to users.

The type attribute is a session-level attribute, and it is not dependent on charset.

a=charset:<character set>

This specifies the character set to be used to display the session name and information data. By default, the ISO-10646 character set in UTF-8 encoding is used. If a more compact representation is required, other character sets may be used. For example, the ISO 8859-1 is specified with the following SDP attribute:

```
a=charset:ISO-8859-1
```


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This is a session-level attribute and is not dependent on charset. The charset specified MUST be one of those registered with IANA, such as ISO-8859-1. The character set identifier is a US-ASCII string and MUST be compared against the IANA identifiers using a case-insensitive comparison. If the identifier is not recognised or not supported, all strings that are affected by it SHOULD be regarded as octet strings.

Note that a character set specified MUST still prohibit the use of bytes 0x00 (Nul), 0x0A (LF), and 0x0d (CR). Character sets requiring the use of these characters MUST define a quoting mechanism that prevents these bytes from appearing within text fields.

a=sdplang:<language tag>

This can be a session-level attribute or a media-level attribute. As a session-level attribute, it specifies the language for the session description. As a media-level attribute, it specifies the language for any media-level SDP information field associated with that media. Multiple sdplang attributes can be provided either at session or media level if multiple languages in the session description or media use multiple languages, in which case the order of the attributes indicates the order of importance of the various languages in the session or media from most important to least important.

In general, sending session descriptions consisting of multiple languages is discouraged. Instead, multiple descriptions SHOULD be sent describing the session, one in each language. However, this is not possible with all transport mechanisms, and so multiple sdplang attributes are allowed although NOT RECOMMENDED.

The "sdplang" attribute value must be a single RFC 3066 language tag in US-ASCII [9]. It is not dependent on the charset attribute. An "sdplang" attribute SHOULD be specified when a session is of sufficient scope to cross geographic boundaries where the language of recipients cannot be assumed, or where the session is in a different language from the locally assumed norm.

a=lang:<language tag>

This can be a session-level attribute or a media-level attribute. As a session-level attribute, it specifies the default language for the session being described. As a media-level attribute, it specifies the language for that media,

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overriding any session-level language specified. Multiple lang attributes can be provided either at session or media level if the session description or media use multiple languages, in which case the order of the attributes indicates the order of importance of the various languages in the session or media from most important to least important.

The "lang" attribute value must be a single RFC 3066 language tag in US-ASCII [9]. It is not dependent on the charset attribute. A "lang" attribute SHOULD be specified when a session is of sufficient scope to cross geographic boundaries where the language of recipients cannot be assumed, or where the session is in a different language from the locally assumed norm.

a=framerate:<frame rate>

This gives the maximum video frame rate in frames/sec. It is intended as a recommendation for the encoding of video data. Decimal representations of fractional values using the notation "<integer>.<fraction>" are allowed. It is a media-level attribute, defined only for video media, and it is not dependent on charset.

a=quality:<quality>

This gives a suggestion for the quality of the encoding as an integer value. The intention of the quality attribute for video is to specify a non-default trade-off between frame-rate and still-image quality. For video, the value is in the range 0 to 10, with the following suggested meaning:

10 - the best still-image quality the compression scheme can give.
5 - the default behaviour given no quality suggestion.
0 - the worst still-image quality the codec designer thinks is still usable.

It is a media-level attribute, and it is not dependent on charset.

a=fmtp:<format> <format specific parameters>

This attribute allows parameters that are specific to a particular format to be conveyed in a way that SDP does not have to understand them. The format must be one of the formats specified for the media. Format-specific parameters may be any set of parameters required to be conveyed by SDP and given

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unchanged to the media tool that will use this format. At most one instance of this attribute is allowed for each format.

It is a media-level attribute, and it is not dependent on charset.

7. Security Considerations

SDP is frequently used with the Session Initiation Protocol [15] using the offer/answer model [17] to agree on parameters for unicast sessions. When used in this manner, the security considerations of those protocols apply.

SDP is a session description format that describes multimedia sessions. Entities receiving and acting upon an SDP message SHOULD be aware that a session description cannot be trusted unless it has been obtained by an authenticated transport protocol from a known and trusted source. Many different transport protocols may be used to distribute session description, and the nature of the authentication will differ from transport to transport. For some transports, security features are often not deployed. In case a session description has not been obtained in a trusted manner, the endpoint SHOULD exercise care because, among other attacks, the media sessions received may not be the intended ones, the destination where media is sent to may not be the expected one, any of the parameters of the session may be incorrect, or the media security may be compromised. It is up to the endpoint to make a sensible decision taking into account the security risks of the application and the user preferences and may decide to ask the user whether or not to accept the session.

One transport that can be used to distribute session descriptions is the Session Announcement Protocol (SAP). SAP provides both encryption and authentication mechanisms, but due to the nature of session announcements it is likely that there are many occasions where the originator of a session announcement cannot be authenticated because the originator is previously unknown to the receiver of the announcement and because no common public key infrastructure is available.

On receiving a session description over an unauthenticated transport mechanism or from an untrusted party, software parsing the session should take a few precautions. Session descriptions contain information required to start software on the receiver’s system. Software that parses a session description MUST NOT be able to start other software except that which is specifically configured as appropriate software to participate in multimedia sessions. It is normally considered inappropriate for software parsing a session

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description to start, on a user's system, software that is appropriate to participate in multimedia sessions, without the user first being informed that such software will be started and giving the user's consent. Thus, a session description arriving by session announcement, email, session invitation, or WWW page MUST NOT deliver the user into an interactive multimedia session unless the user has explicitly pre-authorised such action. As it is not always simple to tell whether or not a session is interactive, applications that are unsure should assume sessions are interactive.

In this specification, there are no attributes that would allow the recipient of a session description to be informed to start multimedia tools in a mode where they default to transmitting. Under some circumstances it might be appropriate to define such attributes. If this is done, an application parsing a session description containing such attributes SHOULD either ignore them or inform the user that joining this session will result in the automatic transmission of multimedia data. The default behaviour for an unknown attribute is to ignore it.

In certain environments, it has become common for intermediary systems to intercept and analyse session descriptions contained within other signalling protocols. This is done for a range of purposes, including but not limited to opening holes in firewalls to allow media streams to pass, or to mark, prioritize, or block traffic selectively. In some cases, such intermediary systems may modify the session description, for example, to have the contents of the session description match NAT bindings dynamically created. These behaviours are NOT RECOMMENDED unless the session description is conveyed in such a manner that allows the intermediary system to conduct proper checks to establish the authenticity of the session description, and the authority of its source to establish such communication sessions. SDP by itself does not include sufficient information to enable these checks: they depend on the encapsulating protocol (e.g., SIP or RTSP).

Use of the "k=" field poses a significant security risk, since it conveys session encryption keys in the clear. SDP MUST NOT be used to convey key material, unless it can be guaranteed that the channel over which the SDP is delivered is both private and authenticated. Moreover, the "k=" line provides no way to indicate or negotiate cryptographic key algorithms. As it provides for only a single symmetric key, rather than separate keys for confidentiality and integrity, its utility is severely limited. The use of the "k=" line is NOT RECOMMENDED, as discussed in Section 5.12.

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8. IANA Considerations

8.1. The "application/sdp" Media Type

One media type registration from RFC 2327 is to be updated, as defined below.

```
To: ietf-types@iana.org
Subject: Registration of media type "application/sdp"

Type name: application

Subtype name: sdp

Required parameters: None.

Optional parameters: None.

Encoding considerations:
   SDP files are primarily UTF-8 format text.  The "a=charset:"
   attribute may be used to signal the presence of other
   character sets in certain parts of an SDP file (see
   Section 6 of RFC 4566).  Arbitrary binary content cannot
   be directly represented in SDP.

Security considerations:
   See Section 7 of RFC 4566

Interoperability considerations:
   See RFC 4566

Published specification:
   See RFC 4566

Applications which use this media type:
   Voice over IP, video teleconferencing, streaming media, instant
   messaging, among others.  See also Section 3 of RFC 4566.

Additional information:

Magic number(s):   None.
File extension(s): The extension ".sdp" is commonly used.
Macintosh File Type Code(s): "sdp "

Person & email address to contact for further information:
   Mark Handley  <M.Handley@cs.ucl.ac.uk>
   Colin Perkins <csp@csperkins.org>
   IETF MMUSIC working group <mmusic@ietf.org>
```


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Intended usage: COMMON

Author/Change controller:
Authors of RFC 4566
IETF MMUSIC working group delegated from the IESG

8.2. Registration of Parameters

There are seven field names that may be registered with IANA. Using the terminology in the SDP specification Backus-Naur Form (BNF), they are "media", "proto", "fmt", "att-field", "bwtype", "nettype", and "addrtype".

8.2.1. Media Types ("media")

The set of media types is intended to be small and SHOULD NOT be extended except under rare circumstances. The same rules should apply for media names as for top-level media content types, and where possible the same name should be registered for SDP as for MIME. For media other than existing top-level media content types, a Standards Track RFC MUST be produced for a new top-level content type to be registered, and the registration MUST provide good justification why no existing media name is appropriate (the "Standards Action" policy of RFC 2434 [8].

This memo registers the media types "audio", "video", "text", "application", and "message".

Note: The media types "control" and "data" were listed as valid in the previous version of this specification [6]; however, their semantics were never fully specified and they are not widely used. These media types have been removed in this specification, although they still remain valid media type capabilities for a SIP user agent as defined in RFC 3840 [24]. If these media types are considered useful in the future, a Standards Track RFC MUST be produced to document their use. Until that is done, applications SHOULD NOT use these types and SHOULD NOT declare support for them in SIP capabilities declarations (even though they exist in the registry created by RFC 3840).

8.2.2. Transport Protocols ("proto")

The "proto" field describes the transport protocol used. This SHOULD reference a standards-track protocol RFC. This memo registers three values: "RTP/AVP" is a reference to RTP [19] used under the RTP Profile for Audio and Video Conferences with Minimal Control [20]

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running over UDP/IP, "RTP/SAVP" is a reference to the Secure Real-time Transport Protocol [23], and "udp" indicates an unspecified protocol over UDP.

If other RTP profiles are defined in the future, their "proto" name SHOULD be specified in the same manner. For example, an RTP profile whose short name is "XYZ" would be denoted by a "proto" field of "RTP/XYZ".

New transport protocols SHOULD be registered with IANA. Registrations MUST reference an RFC describing the protocol. Such an RFC MAY be Experimental or Informational, although it is preferable that it be Standards Track. Registrations MUST also define the rules by which their "fmt" namespace is managed (see below).

8.2.3. Media Formats ("fmt")

Each transport protocol, defined by the "proto" field, has an associated "fmt" namespace that describes the media formats that may be conveyed by that protocol. Formats cover all the possible encodings that might want to be transported in a multimedia session.

RTP payload formats under the "RTP/AVP" and "RTP/SAVP" profiles MUST use the payload type number as their "fmt" value. If the payload type number is dynamically assigned by this session description, an additional "rtpmap" attribute MUST be included to specify the format name and parameters as defined by the media type registration for the payload format. It is RECOMMENDED that other RTP profiles that are registered (in combination with RTP) as SDP transport protocols specify the same rules for the "fmt" namespace.

For the "udp" protocol, new formats SHOULD be registered. Use of an existing media subtype for the format is encouraged. If no media subtype exists, it is RECOMMENDED that a suitable one be registered through the IETF process [31] by production of, or reference to, a standards-track RFC that defines the transport protocol for the format.

For other protocols, formats MAY be registered according to the rules of the associated "proto" specification.

Registrations of new formats MUST specify which transport protocols they apply to.

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8.2.4. Attribute Names ("att-field")

Attribute field names ("att-field") MUST be registered with IANA and documented, because of noticeable issues due to conflicting attributes under the same name. Unknown attributes in SDP are simply ignored, but conflicting ones that fragment the protocol are a serious problem.

New attribute registrations are accepted according to the "Specification Required" policy of RFC 2434, provided that the specification includes the following information:

- o contact name, email address, and telephone number
- o attribute name (as it will appear in SDP)
- o long-form attribute name in English
- o type of attribute (session level, media level, or both)
- o whether the attribute value is subject to the charset attribute
- o a one-paragraph explanation of the purpose of the attribute
- o a specification of appropriate attribute values for this attribute

The above is the minimum that IANA will accept. Attributes that are expected to see widespread use and interoperability SHOULD be documented with a standards-track RFC that specifies the attribute more precisely.

Submitters of registrations should ensure that the specification is in the spirit of SDP attributes, most notably that the attribute is platform independent in the sense that it makes no implicit assumptions about operating systems and does not name specific pieces of software in a manner that might inhibit interoperability.

IANA has registered the following initial set of attribute names ("att-field" values), with definitions as in Section 6 of this memo (these definitions update those in RFC 2327):

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Name	Session or Media level?	Dependent on charset?
cat	Session	No
keywds	Session	Yes
tool	Session	No
ptime	Media	No
maxptime	Media	No
rtpmap	Media	No
recvonly	Either	No
sendrecv	Either	No
sendonly	Either	No
inactive	Either	No
orient	Media	No
type	Session	No
charset	Session	No
sdplang	Either	No
lang	Either	No
framerate	Media	No
quality	Media	No
fmtp	Media	No

8.2.5. Bandwidth Specifiers ("bwtype")

A proliferation of bandwidth specifiers is strongly discouraged.

New bandwidth specifiers ("bwtype" fields) MUST be registered with IANA. The submission MUST reference a standards-track RFC specifying the semantics of the bandwidth specifier precisely, and indicating when it should be used, and why the existing registered bandwidth specifiers do not suffice.

IANA has registered the bandwidth specifiers "CT" and "AS" with definitions as in Section 5.8 of this memo (these definitions update those in RFC 2327).

8.2.6. Network Types ("nettype")

New network types (the "nettype" field) may be registered with IANA if SDP needs to be used in the context of non-Internet environments. Although these are not normally the preserve of IANA, there may be circumstances when an Internet application needs to interoperate with a non-Internet application, such as when gatewaying an Internet telephone call into the Public Switched Telephone Network (PSTN). The number of network types should be small and should be rarely extended. A new network type cannot be registered without registering at least one address type to be used with that network

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type. A new network type registration MUST reference an RFC that gives details of the network type and address type and specifies how and when they would be used.

IANA has registered the network type "IN" to represent the Internet, with definition as in Sections 5.2 and 5.7 of this memo (these definitions update those in RFC 2327).

8.2.7. Address Types ("addrtype")

New address types ("addrtype") may be registered with IANA. An address type is only meaningful in the context of a network type, and any registration of an address type MUST specify a registered network type or be submitted along with a network type registration. A new address type registration MUST reference an RFC giving details of the syntax of the address type. Address types are not expected to be registered frequently.

IANA has registered the address types "IP4" and "IP6" with definitions as in Sections 5.2 and 5.7 of this memo (these definitions update those in RFC 2327).

8.2.8. Registration Procedure

In the RFC documentation that registers SDP "media", "proto", "fmt", "bwtype", "nettype", and "addrtype" fields, the authors MUST include the following information for IANA to place in the appropriate registry:

- o contact name, email address, and telephone number
- o name being registered (as it will appear in SDP)
- o long-form name in English
- o type of name ("media", "proto", "fmt", "bwtype", "nettype", or "addrtype")
- o a one-paragraph explanation of the purpose of the registered name
- o a reference to the specification for the registered name (this will typically be an RFC number)

IANA may refer any registration to the IESG for review, and may request revisions to be made before a registration will be made.

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8.3. Encryption Key Access Methods

The IANA previously maintained a table of SDP encryption key access method ("enckey") names. This table is obsolete, since the "k=" line is not extensible. New registrations MUST NOT be accepted.

9. SDP Grammar

This section provides an Augmented BNF grammar for SDP. ABNF is defined in [4].

```
; SDP Syntax
session-description = proto-version
                      origin-field
                      session-name-field
                      information-field
                      uri-field
                      email-fields
                      phone-fields
                      connection-field
                      bandwidth-fields
                      time-fields
                      key-field
                      attribute-fields
                      media-descriptions

proto-version =       %x76 "=" 1*DIGIT CRLF
                      ;this memo describes version 0

origin-field =        %x6f "=" username SP sess-id SP sess-version SP
                      nettype SP addrtype SP unicast-address CRLF

session-name-field =  %x73 "=" text CRLF

information-field =   [%x69 "=" text CRLF]

uri-field =           [%x75 "=" uri CRLF]

email-fields =        *(%x65 "=" email-address CRLF)

phone-fields =        *(%x70 "=" phone-number CRLF)

connection-field =    [%x63 "=" nettype SP addrtype SP
                      connection-address CRLF]
                      ;a connection field must be present
                      ;in every media description or at the
                      ;session-level
```


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```
   bandwidth-fields =    *(%x62 "=" bwtype ":" bandwidth CRLF)

   time-fields =         1*( %x74 "=" start-time SP stop-time
                         *(CRLF repeat-fields) CRLF)
                         [zone-adjustments CRLF]

   repeat-fields =       %x72 "=" repeat-interval SP typed-time
                         1*(SP typed-time)

   zone-adjustments =    %x7a "=" time SP ["-"] typed-time
                         *(SP time SP ["-"] typed-time)

   key-field =           [%x6b "=" key-type CRLF]

   attribute-fields =    *(%x61 "=" attribute CRLF)

   media-descriptions =  *( media-field
                         information-field
                         *connection-field
                         bandwidth-fields
                         key-field
                         attribute-fields )

   media-field =         %x6d "=" media SP port ["/" integer]
                         SP proto 1*(SP fmt) CRLF

   ; sub-rules of 'o='
   username =            non-ws-string
                         ;pretty wide definition, but doesn't
                         ;include space

   sess-id =             1*DIGIT
                         ;should be unique for this username/host

   sess-version =        1*DIGIT

   nettype =             token
                         ;typically "IN"

   addrtype =            token
                         ;typically "IP4" or "IP6"

   ; sub-rules of 'u='
   uri =                 URI-reference
                         ; see RFC 3986
```


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```
   ; sub-rules of 'e=', see RFC 2822 for definitions
   email-address        = address-and-comment / dispname-and-address
                          / addr-spec
   address-and-comment  = addr-spec 1*SP "(" 1*email-safe ")"
   dispname-and-address = 1*email-safe 1*SP "<" addr-spec ">"

   ; sub-rules of 'p='
   phone-number =        phone *SP "(" 1*email-safe ")" /
                         1*email-safe "<" phone ">" /
                         phone

   phone =               ["+"] DIGIT 1*(SP / "-" / DIGIT)

   ; sub-rules of 'c='
   connection-address =  multicast-address / unicast-address

   ; sub-rules of 'b='
   bwtype =              token

   bandwidth =           1*DIGIT

   ; sub-rules of 't='
   start-time =          time / "0"

   stop-time =           time / "0"

   time =                POS-DIGIT 9*DIGIT
                         ; Decimal representation of NTP time in
                         ; seconds since 1900.  The representation
                         ; of NTP time is an unbounded length field
                         ; containing at least 10 digits.  Unlike the
                         ; 64-bit representation used elsewhere, time
                         ; in SDP does not wrap in the year 2036.

   ; sub-rules of 'r=' and 'z='
   repeat-interval =     POS-DIGIT *DIGIT [fixed-len-time-unit]

   typed-time =          1*DIGIT [fixed-len-time-unit]

   fixed-len-time-unit = %x64 / %x68 / %x6d / %x73

   ; sub-rules of 'k='
   key-type =            %x70 %x72 %x6f %x6d %x70 %x74 /     ; "prompt"
                         %x63 %x6c %x65 %x61 %x72 ":" text / ; "clear:"
                         %x62 %x61 %x73 %x65 "64:" base64 /  ; "base64:"
                         %x75 %x72 %x69 ":" uri              ; "uri:"

   base64      =         *base64-unit [base64-pad]
```


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```
   base64-unit =         4base64-char
   base64-pad  =         2base64-char "==" / 3base64-char "="
   base64-char =         ALPHA / DIGIT / "+" / "/"

   ; sub-rules of 'a='
   attribute =           (att-field ":" att-value) / att-field

   att-field =           token

   att-value =           byte-string

   ; sub-rules of 'm='
   media =               token
                         ;typically "audio", "video", "text", or
                         ;"application"

   fmt =                 token
                         ;typically an RTP payload type for audio
                         ;and video media

   proto  =              token *("/" token)
                         ;typically "RTP/AVP" or "udp"

   port =                1*DIGIT

   ; generic sub-rules: addressing
   unicast-address =     IP4-address / IP6-address / FQDN / extn-addr

   multicast-address =   IP4-multicast / IP6-multicast / FQDN
                         / extn-addr

   IP4-multicast =       m1 3( "." decimal-uchar )
                         "/" ttl [ "/" integer ]
                         ; IPv4 multicast addresses may be in the
                         ; range 224.0.0.0 to 239.255.255.255

   m1 =                  ("22" ("4"/"5"/"6"/"7"/"8"/"9")) /
                         ("23" DIGIT )

   IP6-multicast =       hexpart [ "/" integer ]
                         ; IPv6 address starting with FF

   ttl =                 (POS-DIGIT *2DIGIT) / "0"

   FQDN =                4*(alpha-numeric / "-" / ".")
                         ; fully qualified domain name as specified
                         ; in RFC 1035 (and updates)
```


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```
IP4-address =         b1 3("." decimal-uchar)

b1 =                  decimal-uchar
                      ; less than "224"

; The following is consistent with RFC 2373 [30], Appendix B.
IP6-address =         hexpart [ ":" IP4-address ]

hexpart =             hexseq / hexseq "::" [ hexseq ] /
                      "::" [ hexseq ]

hexseq  =             hex4 *( ":" hex4)

hex4    =             1*4HEXDIG

; Generic for other address families
extn-addr =           non-ws-string

; generic sub-rules: datatypes
text =                byte-string
                      ;default is to interpret this as UTF8 text.
                      ;ISO 8859-1 requires "a=charset:ISO-8859-1"
                      ;session-level attribute to be used

byte-string =         1*(%x01-09/%x0B-0C/%x0E-FF)
                      ;any byte except NUL, CR, or LF

non-ws-string =       1*(VCHAR/%x80-FF)
                      ;string of visible characters

token-char =          %x21 / %x23-27 / %x2A-2B / %x2D-2E / %x30-39
                      / %x41-5A / %x5E-7E

token =               1*(token-char)

email-safe =          %x01-09/%x0B-0C/%x0E-27/%x2A-3B/%x3D/%x3F-FF
                      ;any byte except NUL, CR, LF, or the quoting
                      ;characters ()<>

integer =             POS-DIGIT *DIGIT

; generic sub-rules: primitives
alpha-numeric =       ALPHA / DIGIT

POS-DIGIT =           %x31-39 ; 1 - 9
```


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```
decimal-uchar =       DIGIT
                      / POS-DIGIT DIGIT
                      / ("1" 2*(DIGIT))
                      / ("2" ("0"/"1"/"2"/"3"/"4") DIGIT)
                      / ("2" "5" ("0"/"1"/"2"/"3"/"4"/"5"))

; external references:
      ; ALPHA, DIGIT, CRLF, SP, VCHAR: from RFC 4234
      ; URI-reference: from RFC 3986
      ; addr-spec: from RFC 2822
```

10. Summary of Changes from RFC 2327

The memo has been significantly restructured, incorporating a large number of clarifications to the specification in light of use. With the exception of those items noted below, the changes to the memo are intended to be backward-compatible clarifications. However, due to inconsistencies and unclear definitions in RFC 2327 it is likely that some implementations interpreted that memo in ways that differ from this version of SDP.

The ABNF grammar in Section 9 has been extensively revised and updated, correcting a number of mistakes and incorporating the RFC 3266 IPv6 extensions. Known inconsistencies between the grammar and the specification text have been resolved.

A media type registration for SDP is included. Requirements for the registration of attributes and other parameters with IANA have been clarified and tightened (Section 8). It is noted that "text" and "message" are valid media types for use with SDP, but that "control" and "data" are under-specified and deprecated.

RFC 2119 terms are now used throughout to specify requirements levels. Certain of those requirements, in particular in relation to parameter registration, are stricter than those in RFC 2327.

The "RTP/SAVP" RTP profile and its "fmt" namespace are registered.

The attributes "a=inactive" and "a=maxptime" have been added.

RFC 2327 mandated that either "e=" or "p=" was required. Both are now optional, to reflect actual usage.

The significant limitations of the "k=" field are noted, and its use is deprecated.

Most uses of the "x-" prefix notation for experimental parameters are disallowed and the other uses are deprecated.

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11. Acknowledgements

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