Internet Engineering Task Force (IETF)
Request for Comments: 7006
Category: Standards Track
ISSN: 2070-1721

M. Garcia-Martin
Ericsson
S. Veikkolainen
Nokia
R. Gilman

September 2013

# Miscellaneous Capabilities Negotiation in the Session Description Protocol (SDP)

## Abstract

The Session Description Protocol (SDP) has been extended with a capability negotiation mechanism framework that allows the endpoints to negotiate transport protocols and attributes. This framework has been extended with a media capabilities negotiation mechanism that allows endpoints to negotiate additional media-related capabilities. This negotiation is embedded into the widely used SDP offer/answer procedures.

This memo extends the SDP capability negotiation framework to allow endpoints to negotiate three additional SDP capabilities. In particular, this memo provides a mechanism to negotiate bandwidth ("b=" line), connection data ("c=" line), and session or media titles ("i=" line for each session or media).

## Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc7006.

Table of Contents

## 1. Introduction

The Session Description Protocol (SDP) [RFC4566] is intended for describing multimedia sessions for the purposes of session announcement, session invitation, and other forms of multimedia session initiation. SDP has been extended with an SDP Capability Negotiation Mechanism Framework [RFC5939] that allows the endpoints to negotiate capabilities, such as support for the Real-time Transport Protocol (RTP) [RFC3550] and the Secure Real-time Transport Protocol (SRTP) [RFC3711]. The SDP Media Capabilities Negotiation [RFC6871] provides negotiation capabilities to media lines as well.

The capability negotiation is embedded into the widely used SDP offer/answer procedure [RFC3264]. This memo provides the means to negotiate further capabilities than those specified in the SDP Capability Negotiation Mechanism Framework [RFC5939] and the SDP Media Capabilities Negotiation [RFC6871]. In particular, this memo provides a mechanism to negotiate bandwidth ("b="), connection data ("c="), and session or media titles ("i=").

Since the three added capabilities are independent, it is not expected that implementations will necessarily support all of them at the same time. Instead, it is expected that applications will choose their needed capability for their specific purpose. For this reason, the normative part pertaining to each capability is in a self-contained section: Section 3.1.1 describes the bandwidth capability extension, Section 3.1.2 describes the connection data capability extension, and Section 3.1.3 describes the title capability extension. Separate SDP Capability Negotiation option tags are defined for each capability, allowing endpoints to indicate and/or require support for these extensions according to procedures defined in SDP Capability Negotiation [RFC5939].

## 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 BCP 14, RFC 2119 [RFC2119] and indicate requirement levels for compliant implementations.

## 3. Protocol Description

### 3.1. Extensions to SDP

The SDP Capability Negotiation Framework [RFC5939] and the SDP Media Capabilities Negotiation [RFC6871] specify attributes for negotiating SDP capabilities. These documents specify new attributes (e.g., "acap", "tcap", "rmcap", and "omcap") for achieving their purpose. In this document, we define three new additional capability attributes for SDP lines of the general form:

```
type=value
```

for types "b", "c", and "i". The corresponding capability attributes are respectively defined as:

- "bcap": bandwidth capability
- "ccap": connection data capability
- "icap": title capability

From the sub-rules of the attribute ("a=") line in SDP [RFC4566], SDP attributes are of the form:

```
attribute          = (att-field ":" att-value) / att-field
att-field          = token
att-value          = byte-string
```

Capability attributes use only the "att-field:att-value" form.

The new capabilities may be referenced in potential configurations ("a=pcfg") or in latent configurations ("a=lcfg") as productions conforming to the <extension-config-list>, as respectively defined in RFC 5939 [RFC5939] and RFC 6871 [RFC6871].

```
extension-config-list = ["+"] ext-cap-name "=" ext-cap-list
ext-cap-name          = 1*(ALPHA / DIGIT)
                          ; ALPHA and DIGIT defined in RFC 5234
ext-cap-list          = 1*VCHAR  ; VCHAR defined in RFC 5234
```

The optional "+" is used to indicate that the extension is mandatory and MUST be supported in order to use that particular configuration.

The new capabilities may also be referenced in actual configurations ("a=acfg") as productions conforming to the <sel-extension-config> defined in RFC 5939 [RFC5939].

```
sel-extension-config = ext-cap-name "=" 1*VCHAR
```

The specific parameters are defined in the individual description of each capability below.

The "bcap", "ccap", and "icap" capability attributes can be provided at the SDP session and/or media level. According to the SDP Capability Negotiation [RFC5939], each extension capability must specify the implication of making it part of a configuration at the media level.

According to SDP [RFC4566], "b=", "c=", and "i=" lines may appear at either session or media level. In line with this, the "bcap", "ccap", and "icap" capability attributes, when declared at session level, are to be interpreted as if that attribute was provided with that value at the session level. The "bcap", "ccap", and "icap" capability attributes declared at media level are to be interpreted as if that capability attribute was declared at the media level.

For example, extending the example in [RFC6871] with "icap" and "bcap" capability attributes, we get the following SDP:

```
v=0
o=- 25678 753849 IN IP4 192.0.2.1
s=
c=IN IP4 192.0.2.1
t=0 0
a=bcap:1 CT:200
a=icap:1 Video conference
m=audio 54320 RTP/AVP 0
a=rmcap:1 L16/8000/1
a=rmcap:2 L16/16000/2
a=pcfg:1 m=1|2 pt=1:99,2:98
m=video 66544 RTP/AVP 100
a=rmcap:3 H263-1998/90000
a=rtpmap:100 H264/90000
a=pcfg:10 m=3 pt=3:101 b=1 i=1
```

Figure 1: Example SDP offer with bcap and icap efined at session level

The above SDP defines one PCMU audio stream and one H.264 video stream. It also defines two RTP-based media capabilities ("rmcap" numbered 1 and 2), using 16-bit linear (L16) audio at 8 kbps and 16 kbps, respectively, as well as an RTP-based media capability for H.263 video ("rmcap" numbered 3). The RTP-based media capabilities all appear at the media level. The example also contains a single bandwidth capability ("bcap") and a single title capability ("icap"), both defined at session level. According to the definition above, when the capabilities defined in the "bcap" and "icap" attributes are referenced from the potential configuration, in the resulting SDP they are to be interpreted as session-level attributes (but the RTP-based media capabilities are to be interpreted as media-level attributes).

### 3.1.1. Bandwidth Capability

According to RFC 4566 [RFC4566], the bandwidth field denotes the proposed bandwidth to be used by the session or media. In this memo, we specify the bandwidth capability attribute, which can also appear at the SDP session and/or media level. The bandwidth field is specified in RFC 4566 [RFC4566] with the following syntax:

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

where <bwtype> is an alphanumeric modifier giving the meaning of the <bandwidth> figure.

In this document, we define a new capability attribute: the bandwidth capability attribute "bcap". This attribute lists bandwidth as capabilities, according to the following definition:

```
"a=bcap:" bw-cap-num 1*WSP bwtype ":" bandwidth CRLF
```

where <bw-cap-num> is a unique integer within all the bandwidth capabilities in the entire SDP, which is used to number the bandwidth capability and can take a value between 1 and 2^31-1 (both included). The other elements are as defined for the "b=" field in SDP [RFC4566].

This format satisfies the general attribute production rules in SDP [RFC4566], according to the following Augmented Backus-Naur Form (ABNF) [RFC5234] syntax:

```
att-field       =/ "bcap"
att-value       =/ bw-cap-num 1*WSP bwtype ":" bandwidth
bw-cap-num      = 1*10(DIGIT)   ; DIGIT defined in RFC 5234
```

Figure 2: Syntax of the "bcap" attribute

Negotiation of bandwidth per media stream can be useful when negotiating media encoding capabilities with different bandwidths.

#### 3.1.1.1. Configuration Parameters

The SDP Capability Negotiation Framework [RFC5939] provides for the existence of the "pcfg" and "acfg" attributes. The concept is extended by the SDP Media Capabilities Negotiation [RFC6871] with an "lcfg" attribute that conveys latent configurations.

Extensions to the "pcfg" and "lcfg" attributes are defined through <extension-config-list>, and extensions to the "acfg" attribute are defined through the <sel-extension-config>, as defined in the SDP Capability Negotiation [RFC5939].

In this document, we extend the <extension-config-list> field to be able to convey lists of bandwidth capabilities in latent or potential configurations, according to the following Augmented Backus-Naur Form (ABNF) [RFC5234] syntax:

```
extension-config-list  =/ bandwidth-config-list
bandwidth-config-list  = ["+"] "b=" bw-cap-list *(BAR bw-cap-list)
                              ; BAR defined in RFC 5939
bw-cap-list            = bw-cap-num *("," bw-cap-num)
bw-cap-num             = 1*10(DIGIT)   ; DIGIT defined in RFC 5234
```

Figure 3: Syntax of the bandwidth parameter in "lcfg" and "pcfg" attributes

Each bandwidth capability configuration is a comma-separated list of bandwidth capability attribute numbers where <bw-cap-num> refers to the <bw-cap-num> bandwidth capability numbers defined explicitly earlier in this document, and hence MUST be between 1 and 2^31-1 (both included). Alternative bandwidth configurations are separated by a vertical bar ("|").

The above syntax is very flexible, allowing referencing to multiple "b=" lines per configuration, even for the same <bwtype>. While the need for such definitions is not seen, we have not restricted this, as it is not restricted in SDP [RFC4566] either.

The bandwidth parameter to the actual configuration attribute ("a=acfg") is formulated as a <sel-extension-config> with

```
ext-cap-name = "b"
```

hence

```
sel-extension-config =/ sel-bandwidth-config
sel-bandwidth-config = "b=" bw-cap-list  ; bw-cap-list as above.
```

Figure 4: Syntax of the bandwidth parameter in "acfg" attributes

#### 3.1.1.2. Option Tag

The SDP Capability Negotiation Framework [RFC5939] allows for capability negotiation extensions to be defined. Associated with each such extension is an option tag that identifies the extension in question. Hereby, we define a new option tag "bcap-v0" that identifies support for the bandwidth capability. The endpoints using the "bcap" capability attribute SHOULD add the option tag to other existing option tags present in the "csup" and "creq" attributes in SDP, according to the procedures defined in the SDP Capability Negotiation Framework [RFC5939].

### 3.1.2. Connection Data Capability

According to SDP [RFC4566], the connection data field in SDP contains the connection data, and it has the following syntax:

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

where <nettype> indicates the network type, <addrtype> indicates the address type, and the <connection-address> is the connection address, which is dependent on the address type.

At the moment, network types already defined include "IN", which indicates Internet network type, and "ATM" (see RFC 3108 [RFC3108]), used for describing Asynchronous Transfer Mode (ATM) bearer connections. The Circuit-Switched (CS) descriptions in the SDP document [SDP-CS] adds a "PSTN" network type for expressing a Public Switched Telephone Network (PSTN) circuit switch.

SDP [RFC4566] permits specification of connection data at the SDP session and/or media level. In order to permit negotiation of connection data at the media level, we define the connection data capability attribute ("a=ccap") in the form:

```
"a=ccap:" conn-cap-num 1*WSP nettype SP addrtype SP
connection-address CRLF
```

where <conn-cap-num> is a unique integer within all the connection capabilities in the entire SDP, which is used to identify the connection data capability and can take a value between 1 and 2^31-1 (both included). The other elements are as defined in [RFC4566].

This format corresponds to the [RFC4566] attribute production rules, according to the following Augmented Backus-Naur Form (ABNF) [RFC5234] syntax:

```
att-field       =/ "ccap"
att-value       =/ conn-cap-num 1*WSP nettype SP addrtype
                   SP connection-address
conn-cap-num    = 1*10(DIGIT)   ; 1 to 2^31-1, inclusive
                                ; DIGIT defined in RFC 5234
```

Figure 5: Syntax of the "ccap" attribute

The "ccap" capability attribute allows for expressing alternative connections address ("c=") lines in SDP as part of the SDP Capability Negotiation process. One of the primary use cases for this is offering alternative connection addresses where the <nettype> is "IN" or "PSTN", i.e., selecting between an IP-based bearer or a circuit-switched bearer.

By supporting the "IN" <nettype>, the "ccap" attribute enables the signaling of multiple IPv4 and IPv6 addresses; however, the Standards Track mechanism for negotiation of alternative IP addresses in SDP is Interactive Connectivity Establishment (ICE) [RFC5245]. The "ccap" attribute does not change that; hence, the combined set of actual and potential configurations (as defined in [RFC5939]) for any given media description MUST NOT use the "ccap" attribute to negotiate more than one address with an IN network type (i.e., it is not permissible to select between "IPv4" and "IPv6" address families or different IP addresses within the same IP address family.

Figure 6 is an example of an SDP offer that includes a "ccap" capability attribute. An audio stream can be set up with an RTP flow or by establishing a circuit-switched audio stream:

```
v=0
o=2987933123 2987933123 IN IP4 198.51.100.7
s=-
t=0 0
a=creq:med-v0,ccap-v0
m=audio 38902 RTP/AVP 0 8
c=IN IP4 198.51.100.7
a=ccap:1 PSTN E164 +15555556666
a=tcap:2 PSTN
a=omcap:1 -
a=acap:1 setup:actpass
a=acap:2 connection:new
a=acap:3 cs-correlation:callerid:+15555556666
a=pcfg:1 c=1 t=2 m=1 a=1,2,3
```

Figure 6: Example SDP offer with a "ccap" attribute

The example in Figure 6 represents an SDP offer indicating an audio flow using RTP, such as the one represented in Figure 7, or an audio flow using a circuit-switched connection, such as the one represented in Figure 8.

```
v=0
o=2987933123 2987933123 IN IP4 198.51.100.7
s=-
t=0 0
m=audio 38902 RTP/AVP 0 8
c=IN IP4 198.51.100.7
```

Figure 7: Equivalent SDP offer with the RTP flow

```
v=0
o=2987933123 2987933123 IN IP4 198.51.100.7
s=-
t=0 0
m=audio 9 PSTN -
c=PSTN E164 +15555556666
a=setup:actpass
a=connection:new
a=cs-correlation:callerid:+15555556666
```

Figure 8: Equivalent SDP offer with the circuit-switched flow

This document does not define any mechanism for negotiating or describing different port numbers; hence, the port number from the "m=" line MUST be used by default. Exceptions to this default can be provided by extension mechanisms or network type specific rules. This document defines an exception when the network type is "PSTN",

in which case the port number is replaced with 9 (the "discard" port), as described in "Session Description Protocol (SDP) Extension for Setting Audio and Video Media Streams over Circuit-Switched Bearers in the Public Switched Telephone Network (PSTN)" [SDP-CS]. An endpoint offering alternative IP and PSTN bearers MUST include the IP media description in the actual configuration (IP address in the "c=" line and port number in the "m=" line) and the PSTN media description in the potential configuration.

Exceptions for other network types, such as for the "ATM" network type defined in [RFC3108], require additional specifications.

#### 3.1.2.1. Configuration Parameters

The SDP Capability Negotiation Framework [RFC5939] provides for the existence of the "pcfg" and "acfg" attributes, which can convey one or more configurations to be negotiated. The concept is extended by the SDP Media Capabilities Negotiation [RFC6871] with an "lcfg" attribute that conveys latent configurations.

In this document, we define a <connection-config> parameter to be used to specify a connection data capability in a potential or latent configuration attribute. The parameter follows the form of an <extension-config-list> with

```
ext-cap-name = "c"

ext-cap-list = conn-cap-list
```

where, according to the following Augmented Backus-Naur Form (ABNF) [RFC5234] syntax:

```
extension-config-list =/ conn-config-list
conn-config-list      = ["+"] "c=" conn-cap-list
conn-cap-list         = conn-cap-num *(BAR conn-cap-num)
conn-cap-num          = 1*10(DIGIT)   ; 1 to 2^32-1 inclusive
```

Figure 9: Syntax of the connection data parameter in "lcfg" and "pcfg" attributes

Each capability configuration alternative contains a single connection data capability attribute number and refers to the conn-cap-num capability number defined explicitly earlier in this document; hence, the values MUST be between 1 and 2^31-1 (both included). The connection data capability allows the expression of only a single capability in each alternative, rather than a list of capabilities, since no more than a single connection data field is

permitted per media block. Nevertheless, it is still allowed to express alternative potential connection configurations separated by a vertical bar ("|").

An endpoint includes a plus sign ("+") in the configuration attribute to mandate support for this extension. An endpoint that receives this parameter prefixed with a plus sign and does not support this extension MUST treat that potential configuration as not valid.

The connection data parameter to the actual configuration attribute ("a=acfg") is formulated as a <sel-extension-config> with

```
ext-cap-name = "c"
```

hence

```
sel-extension-config =/ sel-connection-config
sel-connection-config = "c=" conn-cap-num  ; as defined above.
```

Figure 10: Syntax of the connection data parameter in "acfg" attributes

#### 3.1.2.2. Option Tag

The SDP Capability Negotiation Framework [RFC5939] solution allows for capability negotiation extensions to be defined. Associated with each such extension is an option tag that identifies the extension in question. Hereby, we define a new option tag of "ccap-v0" that identifies support for the connection data capability. This option tag SHOULD be added to other existing option tags present in the "csup" and "creq" attributes in SDP, according to the procedures defined in the SDP Capability Negotiation Framework [RFC5939].

### 3.1.3. Title Capability

SDP [RFC4566] provides for the existence of an information field expressed in the format of the "i=" line, which can appear at the SDP session and/or media level. An "i=" line that is present at the session level is known as the "session name", and its purpose is to convey human-readable textual information about the session.

The "i=" line in SDP can also appear at the media level, in which case it is used to provide human-readable information about the media stream to which it is related; for example, it may indicate the purpose of the media stream. The "i=" line is not to be confused with the label attribute ("a=label:", [RFC4574]), which provides a machine-readable tag. It is foreseen that applications declaring capabilities related to different configurations of a media stream

may need to provide different identifying information for each of those configurations. That is, a party might offer alternative media configurations for a stream, each of which represents a different presentation of the same or similar information. For example, an audio stream might offer English or Spanish configurations, or a video stream might offer a choice of video source such as speaker camera, group camera, or document viewer. The title capability is needed to inform the answering user in order to select the proper choice, and the label is used to inform the offering machine which choice the answerer has selected. Hence, there is value in defining a mechanism to provide titles of media streams as capabilities.

As defined in SDP [RFC4566], the session information field ("i=", referred to as "title" in this document) is subject to the "a=charset" attribute in order to support different character sets and hence internationalization. The title capability attribute itself ("a=icap") is, however, not subject to the "a=charset" attribute as this would preclude the inclusion of alternative session/title information each using different character sets. Instead, the session/title value embedded in an "a=icap" attribute (title capability) will be subject to the "a=charset" value used within a configuration that includes that title capability. This provides for consistent SDP operation while allowing for capabilities and configurations with different session/title information values with different character set encodings (with each such configuration including an "a=charset" value with the relevant character set for the session/title information in question).

According to SDP [RFC4566], the session information ("i=") line has the following syntax:

```
"i=" text
```

where "text" represents a human-readable text indicating the purpose of the session or media stream.

In this document, we define a new capability attribute: the title capability "icap". This attribute lists session or media titles as capabilities, according to the following definition:

```
"a=icap:" title-cap-num 1*WSP text
```

where <title-cap-num> is a unique integer within all the connection capabilities in the entire SDP, which is used to identify the particular title capability and can take a value between 1 and 2^31-1 (both included). <text> is a human-readable text that indicates the purpose of the session or media stream it is supposed to characterize.

As an example, one might use:

```
a=icap:1 Document Camera
```

to define a title capability number 1 to identify a particular source of a media stream.

Or, in another example, one might offer two title capabilities with different character encodings (using the charset attribute defined in "SDP: Session Description Protocol" [RFC4566] and the generic attribute capability attribute ("a=acap:") defined in "Session Description Protocol (SDP) Capability Negotiation" [RFC5939]).

```
a=icap:1 [Text encoded in ISO-8859-1]
a=acap:1 charset:ISO-8859-1
a=icap:2 [Text encoded in UTF-8]
a=acap:2 charset:UTF-8
```

NOTE: Due to limitations of the ASCII encoding of RFCs, the actual text with non-printable characters cannot be represented in the text. See the PDF format of this RFC for a figure with non-printable characters.

The title capability attribute satisfies the general attribute production rules in SDP [RFC4566], according to the following Augmented Backus-Naur Form (ABNF) [RFC5234] syntax:

```
att-field       =/ "icap"
att-value       =/ title-cap-num 1*WSP text
                                ; text defined in RFC 4566
title-cap-num   = 1*10(DIGIT)   ; DIGIT defined in RFC 5234
```

Figure 11: Syntax of the "icap" attribute

#### 3.1.3.1. Configuration Parameters

The SDP Capability Negotiation Framework [RFC5939] provides for the existence of the "pcfg" and "acfg" attributes. The concept is extended by the SDP Media Capabilities Negotiation [RFC6871] with an "lcfg" attribute that conveys latent configurations.

In this document, we define a <title-config-list> parameter to be used to convey title capabilities in a potential or latent configuration. This parameter is defined as an <extension-config-list> with the following associations:

ext-cap-name = "i"

ext-cap-list = title-cap-list

This leads to the following definition for the title capability parameter:

```
extension-config-list =/ title-config-list
title-config-list     = ["+"] "i=" title-cap-list
title-cap-list        = title-cap-num *(BAR title-cap-num)
                                  ; BAR defined in RFC 5939
title-cap-num         = 1*10(DIGIT) ; DIGIT defined in RFC 5234
```

Figure 12: Syntax of the title capability parameter in "lcfg" and "pcfg" attributes

Each potential capability configuration contains a single title capability attribute number where "title-cap-num" is the title capability number defined explicitly earlier in this document, and hence must be between 1 and 2^31-1 (both included). The title capability allows the expression of only a single capability in each alternative, since no more than a single-title field is permitted per block. Nevertheless, it is still allowed to express alternative potential title configurations separated by a vertical bar ("|").

An endpoint includes a plus sign ("+") in the configuration attribute to mandate support for this extension. An endpoint that receives this parameter prefixed with a plus sign and does not support this extension MUST treat that potential configuration as not valid.

The title parameter to the actual configuration attribute ("a=acfg") is formulated as a <sel-extension-config> with

ext-cap-name = "i"

hence

```
sel-extension-config =/ sel-title-config
sel-title-config = "i=" title-cap-num  ; as defined above.
```

Figure 13: Syntax of the title parameter in "acfg" attributes

#### 3.1.3.2. Option Tag

At present, it is difficult to envision a scenario in which the "icap" attribute must be supported or the offer must be rejected. In most cases, if the icap attribute or its contents were to be ignored, an offered configuration could still be chosen based on other criteria such as configuration numbering. However, one might imagine an SDP offer that contained English and Spanish potential configurations for an audio stream. The session might be unintelligible if the choice is based on configuration numbering, rather than informed user selection. Based on such considerations, it may well prove useful to announce the ability to use the icap attribute and its contents to select media configurations, or to inform the user about the selected configuration(s). Therefore, we define a new option tag of "icap-v0" that identifies support for the title capability. This option tag SHOULD be added to other existing option tags present in the "csup" and/or "creq" attributes in SDP, according to the procedures defined in the SDP Capability Negotiation Framework [RFC5939]. The discussion above suggests that "icap-v0" will typically appear in a "csup" attribute, but rarely in a "creq" attribute.

### 3.2. Session Level versus Media Level

The "bcap", "ccap", and "icap" attributes can appear at the SDP session and/or media level. Endpoints MUST interpret capabilities declared at session level as part of the session level in the resulting SDP for that particular configuration. Endpoints MUST interpret capabilities declared at media description as part of the media level in the resulting SDP for that particular configuration.

The presence of the "bcap" capability for the same <bwtype> at both the session and media level is subject to the same constraints and restrictions specified in RFC 4566 [RFC4566] for the bandwidth attribute "b=".

To avoid confusion, the <type-attr-num> for each "a=bcap", "a=ccap", and "a=icap" line MUST be unique across all capability attributes of the same type within the entire session description.

### 3.3. Offer/Answer Model Extensions

In this section, we define extensions to the offer/answer model defined in SDP Offer/Answer Model [RFC3264] and extended in the SDP Capability Negotiation [RFC5939] to allow for bandwidth, connection, and title capabilities to be used with the SDP Capability Negotiation Framework.

#### 3.3.1. Generating the Initial Offer

When an endpoint generates an initial offer and wants to use the functionality described in the current document, it first defines appropriate values for the bandwidth, connection data, and/or title capability attributes according to the rules defined in [RFC4566] for "b=", "c=", and "i=" lines. The endpoint then MUST include the respective capability attributes and associated values in the SDP offer. The preferred configurations for each media stream are identified following the media line in a "pcfg" attribute. Bandwidth and title capabilities may also be referenced in latent configurations in an "lcfg" attribute, as defined in the SDP Media Capabilities Negotiation [RFC6871].

Implementations are advised to pay attention to the port number that is used in the "m=" line. By default, a potential configuration that includes a connection data capability will use the port number from the "m=" line, unless the network type is "PSTN", in which case the default port number used will be 9.

The offer SHOULD include the level of capability negotiation extensions needed to support this functionality in a "creq" attribute.

#### 3.3.2. Generating the Answer

When the answering party receives the offer, and if it supports the required capability negotiation extensions, it SHOULD select the most preferred configuration it can support for each media stream and build the answer accordingly, as defined in Section 3.6.2 of the SDP Capability Negotiation [RFC5939].

If the connection data capability is used in a selected potential configuration chosen by the answerer, that offer configuration MUST by default use the port number from the actual offer configuration (i.e., the "m=" line), unless the network type is "PSTN", in which case the default port MUST be assumed to be 9. Extensions may be defined to negotiate the port number explicitly instead.

### 3.3.3. Offerer Processing of the Answer

When the offerer receives the answer, it MUST process the media lines according to normal SDP processing rules to identify the media stream(s) accepted by the answer, if any, as defined in Section 3.6.3 of the SDP Capability Negotiation [RFC5939]. The "acfg" attribute, if present, MUST be used to verify the proposed configuration used to form the answer and to infer the lack of acceptability of higher-preference configurations that were not chosen.

### 3.3.4. Modifying the Session

If, at a later time, one of the parties wishes to modify the operating parameters of a session, e.g., by adding a new media stream or by changing the properties used on an existing stream, it may do so via the mechanisms defined for SDP offer/answer [RFC3264] and in accordance with the procedures defined in Section 3.6.4 of the SDP Capability Negotiation [RFC5939].

## 4. Field Replacement Rules

To simplify the construction of SDP records, given the need to include fields within the media description in question for endpoints that do not support capabilities negotiation, we define some simple field-replacement rules for those fields invoked by potential or latent configurations. In particular, any "i=" or "c=" lines invoked by a configuration MUST replace the corresponding line, if present within the media description in question. Any "b=" line invoked by a configuration MUST replace any "b=" of the same bandwidth type at the media level, but not at the session level.

## 5. Security Considerations

This document provides an extension on top of the SDP [RFC4566], SDP Offer/Answer Model [RFC3264], SDP Capability Negotiation Framework [RFC5939], and SDP Media Capabilities Negotiation [RFC6871]. As such, the security considerations of those documents apply.

The bandwidth capability attribute may be used for reserving resources at endpoints and intermediaries that inspect SDP. Modification of the bandwidth value by an attacker can lead to the network being underutilized (too high bandwidth value) or congested (too low bandwidth value).

Similarly, by modifying the alternative connection address(es), an attacker would be able to direct media streams to a desired endpoint, thus launching a version of the well-known voice hammer attack (see Section 18.5.1 of [RFC5245]).

The title capability provides for alternative "i=" line information, which is intended for human consumption. However, manipulating the textual information could be misused to provide false information, leading to a bad user experience or the person using the service making a wrong choice regarding the available media streams.

In case it is essential to protect the capability attribute values, one of the security mechanisms proposed in [RFC5939] SHOULD be used.

The "i=" line, and thus the value carried in the title capability attribute, is intended for human-readable description only. It should not be parsed programmatically.

## 6. IANA Considerations

### 6.1. New SDP Attributes

IANA has registered new attributes in the "att-field (both session and media level)" subregistry of the "Session Description Protocol (SDP) Parameters" registry, according to the following registration form:

| | |
|---|---|
| Attribute name: | bcap |
| Long form name: | Bandwidth Capability |
| Type of attribute: | Both media and session level |
| Subject to charset: | No |
| Purpose: | Negotiate session or media-level bandwidths |
| Appropriate values: | See RFC 7066, Section 3.1.1 |
| Contact name: | Miguel A. Garcia<br>Miguel.A.Garcia@ericsson.com |

| | |
|---|---|
| Attribute name: | ccap |
| Long form name: | Connection Data Capability |
| Type of attribute: | Both media and session level |
| Subject to charset: | No |
| Purpose: | Negotiate media-level connection data |
| Appropriate values: | See RFC 7066, Section 3.1.2 |
| Contact name: | Miguel A. Garcia<br>Miguel.A.Garcia@ericsson.com |

| | |
|---|---|
| Attribute name: | icap |
| Long form name: | Title Capability |
| Type of attribute: | Both media and session level |
| Subject to charset: | Yes |
| Purpose: | Negotiate human-readable information describing the session or media |
| Appropriate values: | See RFC 7066, Section 3.1.3 |
| Contact name: | Miguel A. Garcia Miguel.A.Garcia@ericsson.com |

### 6.2. New Option Tags

IANA has added the new option tags "bcap-v0", "ccap-v0", and "icap-v0", defined herein, to the "SDP Capability Negotiation Option Tag" subregistry of the "Session Description Protocol (SDP) Parameters" registry.

### 6.3. New SDP Capability Negotiation Configuration Parameters

IANA has added the new parameter identifiers "b" for "Bandwidth", "c" for "Connection Data", and "i" for "Title" to the "SDP Capability Negotiation Configuration Parameters" subregistry of the "Session Description Protocol (SDP) Parameters" registry. These parameters are permitted in "lcfg", "acfg", and "pcfg" attributes.

## 7. Acknowledgments

Thanks to Christer Holmberg, Alf Heidermark, and Ingemar Johansson for arguing for the existence of this document and reviewing it in the early stages. Thanks to Flemming Andreasen, Andrew Allen, and Jonathan Lennox for a detailed review and many suggestions for improvement.

## 8. References

### 8.1. Normative References

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

[RFC3264] Rosenberg, J. and H. Schulzrinne, "An Offer/Answer Model with Session Description Protocol (SDP)", RFC 3264, June 2002.

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

[RFC5234] Crocker, D. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", STD 68, RFC 5234, January 2008.

[RFC5939] Andreasen, F., "Session Description Protocol (SDP) Capability Negotiation", RFC 5939, September 2010.

[RFC6871] Gilman, R., Even, R., and F. Andreasen, "Session Description Protocol (SDP) Media Capabilities Negotiation", RFC 6871, February 2013.

## 8.2. Informative References

[RFC3108] Kumar, R. and M. Mostafa, "Conventions for the use of the Session Description Protocol (SDP) for ATM Bearer Connections", RFC 3108, May 2001.

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

[RFC3711] Baugher, M., McGrew, D., Naslund, M., Carrara, E., and K. Norrman, "The Secure Real-time Transport Protocol (SRTP)", RFC 3711, March 2004.

[RFC4574] Levin, O. and G. Camarillo, "The Session Description Protocol (SDP) Label Attribute", RFC 4574, August 2006.

[RFC5245] Rosenberg, J., "Interactive Connectivity Establishment (ICE): A Protocol for Network Address Translator (NAT) Traversal for Offer/Answer Protocols", RFC 5245, April 2010.

[SDP-CS] Garcia, M. and S. Veikkolainen, "Session Description Protocol (SDP) Extension for Setting Audio and Video Media Streams over Circuit-Switched Bearers in the Public Switched Telephone Network (PSTN)", Work in Progress, June 2013.

## Authors' Addresses

Miguel A. Garcia-Martin
Ericsson
Calle Via de los Poblados 13
Madrid 28033
Spain

Phone: +34 91 339 1000
EMail: miguel.a.garcia@ericsson.com

Simo Veikkolainen
Nokia
P.O. Box 226
NOKIA GROUP, FI 00045
Finland

Phone: +358 50 486 4463
EMail: simo.veikkolainen@nokia.com

Robert R. Gilman
3243 W. 11th Ave. Dr.
Broomfield, Colorado 80020
U.S.A.

Phone: +1 303 898 9780
EMail: bob_gilman@comcast.net