Telepresence Interoperability Protocol ("TIP")
Evaluation License

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Cisco TIP Endpoint IX 8
Implementation Profile Supplement
(for use with TIP v8)

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Modification History

Revision	Date	Originator	Comments
1.0	12/12/2014	Cisco Systems, Inc.	Initial document

Contents

1   Introduction to TIP

Telepresence Interoperability Protocol (TIP) systems are generally high-end, high-definition video conferencing devices capable of handling multiple audio and video streams. Capabilities that are negotiated in TIP are complimentary to those which are signaled and negotiated using VoIP call setup signaling protocols, such as SIP/SDP.

TIP devices can be endpoints, including single and multi-screen systems participating in point-to-point and multipoint sessions. Media sources are switched when necessary to always present the viewer with the most suitable session participants.

TIP devices can be multipoint devices, such as a multipoint control unit (MCU). In the case of multipoint sessions, endpoints will exchange TIP messaging with MCU that implements TIP. For purposes of this document, "MCU" or "multipoint control device" or "multipoint device" will be used interchangeably, referring to a multipoint session controlling device that may or may not terminate or transcode any of the video or audio media before forwarding on to the rest of the endpoints in a multipoint session.

2   Introduction to Cisco TIP Implementation Profile(s)

This Cisco TIP Implementation Profile document explains what options Cisco TelePresence devices require, can accept and/or do prefer among those defined in the TIP specification. Additional information complementary to TIP needed to achieve interoperability with a Cisco TelePresence installation is also included below, such as what SIP/SDP messaging is required and how to establish encrypted channels.

Unlike prior TIP profile documents published by Cisco, this document only considers interoperability with the Cisco TelePresence IX5000 Series [12] in TIPv8 using the H.265 codec. For interoperability with the Cisco TelePresence IX5000 Series with H.264, please reference the Cisco TX 6.0 endpoint profile supplement document [11].

Some considerations, such as for bandwidth, contained in this document, will supersede like information provided in the Cisco TX 6.0 endpoint profile supplement when establishing the use of the H.265 codec for the Main video screens.

These profile documents will be updated as needed for clarity or corrections and new versions will be published as Cisco TelePresence products evolve or as new software releases enable new options, sometimes asynchronous from revisions to the TIP protocol. Information related to interoperating with another company's TIP products is not considered in this document.

2.1   Cisco Implementation Profile IX 8.0 for TIP v8 Installations

This document, which focuses on the use of H.265 for main video, is meant to be used as a supplement to the previously published Cisco endpoint profiles [11] for fitting in to a Cisco TelePresence TIP v7 or TIP v8 installation with an IX 8.0 or later software release on the newest Cisco Immersive TelePresence System IX endpoints.

All of the instructions in Cisco TX 6.0 TIP Implementation Endpoint profile supplement [11], as well as parts of the Cisco TIP Implementation Profile 1.8 -1.10 [11] documents, are required by third-party TIP implementations, except where supplemented or superseded by the requirements or instructions that follow in this document.

This document adds instructions for the following functionality;

1.   Main video screen up to a maximum of 60 fps with the H.265 codec
2.   Updates to the mid-call Video line bitrate (b=TIAS) value to resolution mappings when using the H.265 codec on the main video streams in TIP

Product Family	TIP v6	TIP v7	TIP v8
Cisco TelePresence Immersive endpoints (500, 1100, 1300, 3000, 9000 and 5000)	Release 1.6.5 and later releases for the CTS Series.	Release 1.7.0 and later releases for the CTS Series. Releases TX 6.0 and IX 8.0 or later for the TX and IX Series respectively.	Release 1.10 for the CTS Series. Releases TX 6.0 and IX 8.0 or later for the TX and IX Series respectively.
Cisco TelePresence Server	Release 2.1.0 and later releases	Release 2.2.x and later releases	Release version 3.0(2.46) or later. Prefer BFCP Support added in version 3.1
Cisco TelePresence Multipoint Switch	Release 1.6.4 and later releases	Release 1.7.0 through 1.9.x	Not supported

Table 1: Cisco Products with TIP support
[Please check www.cisco.com/go/tip for the latest updates to this table.]

3   H.265 on Main Video up to 60 fps

Coincidental with the release of TIP v8 in IX 8 software available on the latest Cisco TIP endpoint, the Cisco TelePresence IX5000, the H.265 codec up to 1080 resolution and 60 frames per second (fps) may be negotiated in TIP Sessions for the Main Video screens only.

To receive H.265, be sure to indicate that no constraints are required by your receiver (RX=0) per "Unrestricted Media" per Section 4.2.5.12 of the TIP v8 protocol specification [11].

3.1   Shared Content Stream Considerations

The shared auxiliary content, controlled by TIP or BFCP, will only support H.264.   As a consequence, preferring BFCP is REQUIRED when trying to establish the H.265 codec for the main video screen(s) so that H.264 can be separately negotiated on the BFCP m-line.

As a reminder, section 4.2.5.13 of the TIP v8 specification [11] allows a sender to indicate that it prefers to use a separate media line and the BFCP protocol for shared auxiliary video (often used for sharing a presentation) control instead of the multiplexed stream and control for shared auxiliary video available in TIP.

3.2   Bandwidth Considerations

TIP devices MUST include b=TIAS [16] field associated with any video media lines in every SDP offer and answer.

      a.   For the initial call setup and after a resume (i.e., first reINVITE transaction resuming media), the value of the b=TIAS field for video MUST be that of a single HD video stream. Reference section Table 3 in the Cisco TX 6.0 TIP Implementation Endpoint profile supplement document [11] for the value in non-secure sessions. Reference section 5 and 6 of the Cisco TIP Endpoint Profile 1.8-1.10 document [11] for adding security overhead to the values.

      b.   After TIP negotiation has completed, a mid-call INVITE will be needed to make adjustments to the value of the b=TIAS for the video line to accommodate the needs of all of the video stream positions negotiated in TIP (eg, multiple screens, legacy and AUX). Reference section 3.8 of the Cisco TIP Endpoint Profile 1.8-1.10 document [11] and Table 2 below for the value for each H.265 main video stream, which is roughly 60% of that for our H.264 negotiated values in non-secure sessions. Reference section 5 and

6 of the Cisco TIP Endpoint Profile 1.8-1.10 document [11] for adding security overhead.

Negotiated video line bit rate (Mbps) with H.265	Corresponding main video resolution mapped
b=TIAS >= 3.15	1080p60 Better
2.7 <= b=TIAS < 3.15	1080p60 Minimal
2.1 <= b=TIAS < 2.7	720p60 Best or 1080p30 Better
1.35 <= b=TIAS < 2.1	720p60 Better or 1080p30 Minimal
0.9 <= b=TIAS < 1.35	720p30 Better or 720p60 Minimal
.562 <= b=TIAS < 0.9	720p30 Minimal
b=TIAS < .562	Call Drop

Table 2: Video Line Bit rate (b=TIAS) to H.265 Main Video resolution mapping

c.   It is RECOMMENDED that the overall session bandwidth value offered be equal to or greater than the sum of all media. In cases where the overall session bandwidth negotiated is less than the sum of all media, the remaining bandwidth available for video, after deducting audio bandwidth, will be allocated between main and auxiliary video streams using a configured policy set by the customer. In such a case where the overall session bandwidth negotiated is less than the sum of all the media, there is no guarantee that the maximum resolution goal shown in Table 3 will be achieved.

3.3 SDP Considerations

Please note that the Cisco Unified Communications Manager 10.0 release or later is required for H.265 support.

1. To achieve 60 fps, MUST use `max-fs` and `max-mbps` [7]
2. MUST use `max-fps` [6]
3. MUST use `max-lps` [12]
4. MUST use `max-lsr` [12]
5. RECOMMENDED to use `dec-parallel-cap` [12]

Example initial call setup from the IX 5000 indicating it can decode H.265 up to 60fps

```
b=TIAS:6000000^M
a=rtpmap:99 H265/90000^M
a=fmtp:99 level-id=120;max-lps=2088960;max-lsr=125337600;dec-parallel-
cap={t:28;level-id=90};max-fps=6000^M
```

Example mid-call INVITE after TIP negotiation for 3 main video streams w/ H.265 up to 60fps and includes security overhead

```
b=TIAS:11340000^M
a=rtpmap:99 H265/90000^M
a=fmtp:99  level-id=120;max-lps=2088960;max-lsr=125337600;dec-
parallel-cap={t:28;level-id=90};max-fps=6000^M
```

4   Summary of Changes to this document

Initial version of document; no changes.

5   References

[1] IETF RFC 3261 "SIP: Session Initiation Protocol"

[2] IETF RFC 3264 "An Offer/Answer Model with the Session Description Protocol (SDP)"

[3] IETF RFC 2327 "SDP: Session Description Protocol"

[5] IETF RFC 3890 "A Transport Independent Bandwidth Modifier for the Session Description Protocol (SDP)"

[6] IETF Draft "Additional H.241 Parameter in the RTP Payload Format for H.264 Video"
http://tools.ietf.org/html/draft-kristensen-payload-rtp-h241param-00

[7] IETF RFC 3984 "RTP Payload Format for H.264 Video"

[8] unused

[9] IETF Draft "The Binary Floor Control Protocol (BFCP)" update
http://tools.ietf.org/html/draft-ietf-bfcpbis-rfc4582bis

[10] "Cisco Unified Communications Manager SIP Line Messaging Guide (Standard)" can be found at http://developer.cisco.com/web/sip/docs

 [11] Telepresence Interoperability Protocol (TIP), version 6, 7 or 8 and all the Cisco TIP Endpoint Implementation Profile revisions can be downloaded at http://www.imtc.org/tip

[12] Cisco TelePresence IX5000 Series
http://www.cisco.com/c/en/us/products/collaboration-endpoints/ix5000-series/index.html

[13] RTP Payload Format for High Efficiency Video Coding
https://tools.ietf.org/id/draft-ietf-payload-rtp-h265-07.txt

Glossary

AAC-LD	MPEG-4 Advanced Audio Coding - Low Delay Audio
AES	Advanced Encryption Standard
AVP / SAVP	Audio Video Profile / Secure Audio Video Profile
CABAC	Context-adaptive binary arithmetic coding
CALVC	Context-adaptive variable length coding
CIF	A video format that supports both NTSC and PAL signals
CSRC	Contributing Source in RTP
DTLS	Datagram Transport Layer Security
EKT	Encrypted Key Transport
GDR	Gradual Decoder Refresh
IDR	Instantaneous Decoder Refresh
LTRP	Long-Term Reference Picture
MCU	Multipoint Control Unit
MUX	Multiplexer/Multiplexing
NAL	Network Abstraction Layer
NTP	Network Time Protocol
PPS	Packets per second or Picture Parameter Set
RSA	Rivest, Shamir and Adleman (an encryption protocol)
RTCP	Real-Time Control Protocol
RTP	Real-Time Protocol
SDP	Session Description Protocol
SEI	Supplemental Enhancement Information for H.264 Frames
SIP	Session Initiation Protocol
SPIMAP	Serial Peripheral Interface Map
SPS	Sequence Parameter Set
SRTCP	Secure Real-Time Control Protocol
SRTP	Secure Real-Time Protocol
SSRC	Synchronization Source in RTP
STUN	Simple Traversal of UDP through Network Address Translators (NATs)
TIAS	Transport Independent Application Specific descriptions in SIP
TLS	Transport Layer Security
UCM	(Cisco) Unified Communications Manager