



Telepresence Interoperability Protocol (“TIP”) Evaluation License

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Cisco TIP Endpoint TX 6 Implementation Profile (for use with TIP v8)

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Modification History

| Revision | Date | Originator | Comments |
|----------|------------|---------------------|------------------|
| 1.0 | 12/12/2012 | Cisco Systems, Inc. | Initial document |
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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.

These profile documents are written with the assumption that an implementer of a video conferencing device will want it to interoperate with the broadest set of Cisco TelePresence products that implement TIP in the broadest set of use cases. This document does not consider interoperability with constrained use cases or interoperability within a limited subset of Cisco TelePresence devices, which may or may not be more relaxed than the requirements or restrictions described below.

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.

The profile information below includes requirements related to SIP signaling, TIP signaling, media encoding constraints, and other general behavior, to help achieve interoperability with a Cisco TelePresence system supporting TIP v7 or later .

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2.1 Cisco Implementation Profile TX 6.0 for TIP v7 and v8 Installations

This document is meant to be used as a supplement to the Cisco TIP Implementation Profile 1.8 through 1.10 [11] for fitting in to a Cisco TelePresence TIP v7 or TIP v8 installation with the TX6 or later software releases on the newest Cisco Immersive TelePresence Systems (TX endpoints).

All the instructions in the Cisco TIP Implementation Profile 1.8 -1.10 [11] are required by third-party TIP implementations in this document, except where augmented or supplemented by the requirements or instructions that follow in this document.

This document adds instructions for the following functionality;

1. Prefer BFCP option for shared, auxiliary media
2. Main video up to a maximum of 60 fps
3. Updates to the Video line bitrate (b=TIAS) value to resolution mappings when using BFCP for higher resolution presentation sharing or 60 fps on the main video streams

| Product Family | TIP v6 | TIP v7 | TIP v8 |
|---|----------------------------------|----------------------------------|---|
| Cisco TelePresence Immersive endpoints (500, 1100, 1300, 3000, 9000, etc) | Release 1.6.5 and later releases | Release 1.7.0 and later releases | Release 1.10 plus the TX 6.0 and later releases |
| Cisco TelePresence Multipoint Switch | Release 1.6.4 and later releases | Release 1.7.0 through 1.9.x | Not supported |
| Cisco TelePresence Server | Release 2.1.0 and later releases | Release 2.2.x and later releases | Future release |

Table 1: Cisco Products with TIP support

[Please check www.cisco.com/go/tip for the latest updates to this table.]

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3 Prefer BFCP

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 (often used for sharing a presentation) video control instead of the multiplexed stream and control for shared auxiliary video available in TIP.

Cisco TIP devices that utilize TX 6 or later releases will both attempt to negotiate a separate BFCP over UDP [9] media line and will indicate they prefer BFCP in TIP's MediaOptions negotiation. If BFCP over UDP is successfully negotiated in SIP, Cisco TIP devices will default to preferring the use of BFCP regardless of the maximum resolution targeted, but note that shared auxiliary resolutions larger than XGA will only be supported when using BFCP. For clarity, video media controlled by BFCP is on a separate RTP session from the multiplexed TIP media and thus does not utilize any of TIP's feedback or other messaging.

UCM 8.6.1 or later release¹ is required to negotiate a BFCP over UDP session.

3.1 Security Considerations

Also note that Cisco TIP devices that utilize BFCP over UDP, will only establish secure media via SDES negotiation for the video media line controlled by BFCP. When using BFCP in conjunction with TIP, this means it possible to have DTLS-SRTP for securing the audio and video sessions in the TIP multiplexed sessions while securing the media in the BFCP line via SDES negotiation in SIP. Alternatively, SDES could be used for negotiating security for all the media in such a hybrid BFCP and TIP call. Although allowed, it is NOT RECOMMENDED to a have a mixed secure and unsecure media in such a hybrid BFCP and TIP call. Please reference sections 5 and 6 in the Cisco TIP Endpoint Profile 1.8-1.10 document [11] for further details on how to negotiate and establish secure media.

3.2 Bandwidth Considerations

¹ Note that the customer may need to configure the installed UCM to turn on the support of BFCP over UDP

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TIP devices MUST include a b=TIAS [5] field associated with any video media lines in every SDP offer and answer, including the video media session controlled by BFCP.

- a. Reference Table 2 below for the value of the b=TIAS field for the non-secure video media session controlled by BFCP in order to enable the maximum resolution desired. Reference section 5 and 6 of the Cisco TIP Endpoint Profile 1.8-1.10 document [11] for adding security overhead to the values shown in Table 2.
- 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 session controlled by TIP to accommodate the needs of all of the video stream positions negotiated in TIP (eg, multiple screens and legacy). It is RECOMMENDED that the value of the b=TIAS field for the video media session controlled by BFCP remain unchanged in the mid-call INVITE if Prefer BFCP was agreed to by both TIP peers.
- 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 video streams and the shared video stream controlled by BFCP by Cisco TIP devices using a configured policy set by the customer. This means that in such a case where the overall session bandwidth negotiated is less than the sum of all the media, the maximum resolution goal shown in Table 2 may not be achieved. Also, Cisco TIP devices now give customer the ability to set policy on how the entire video bandwidth is managed, so there is no guarantee that the maximum resolution goal shown in Table 2 will be achieved for a given line bit rate negotiated.

| Negotiated BFCP Media line bit rate (Mbps) | Corresponding media resolution mapped |
|--|---------------------------------------|
| $b=TIAS \geq 4$ | Up to 1080p30 |
| $2.25 \leq b=TIAS < 4.0$ | Up to 720p30 |
| $1.0 \leq b=TIAS < 2.25$ | Up to 1080p5 |
| $.500 \leq b=TIAS < 1.0$ | Up to 720p5 |
| $.100 \leq b=TIAS < .500$ | Up to XGA 5 fps |
| $b=TIAS < .100$ | Shared Line Dropped |

Table 2: BFCP Media Line Bit rate (b=TIAS) to resolution mapping

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4 Main Video at 60 fps

Coincidental with the release of TIP v8 in TX 6 software available on some Cisco TIP devices, 60 frames per second (fps) may be negotiated in TIP Sessions. It can be negotiated in SDP and used in either a TIP v7 or TIP v8 session for either 720p or 1080p main video resolutions. Shared auxiliary content, controlled by TIP or BFCP, will only support a maximum of 30 fps.

4.1 SDP Considerations

1. To achieve 60 fps, MUST use `max-fs` and `max-mbps` [7]
2. HIGHLY RECOMMENDED to use of the attribute `max-fps` [6]
3. MUST indicate a packetization-mode 1

If attribute `max-fps` is not indicated in SDP, then is calculated per below by Cisco TIP devices:

$$\text{max-fps} = \text{max-mbps} / f\{\min(8160, \text{remote_max-fs})\}$$

4.2 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 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 shown in Table 3.
- 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 3 below for the value per main video stream 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.

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| Negotiated video line bit rate (Mbps) | Corresponding main video resolution mapped |
|---------------------------------------|--|
| $b=TIAS \geq 6.0$ | 1080p60 Best |
| $5.25 \leq b=TIAS < 6.0$ | 1080p60 Better |
| $4.5 \leq b=TIAS < 5.25$ | 1080p60 Minimal |
| $3.5 \leq b=TIAS < 4.5$ | 720p60 Best or 1080p30 Better |
| $2.25 \leq b=TIAS < 3.5$ | 720p60 Better or 1080p30 Minimal |
| $1.5 \leq b=TIAS < 2.25$ | 720p30 Better or 720p60 Minimal |
| $.936 \leq b=TIAS < 1.5$ | 720p30 Minimal |
| $b=TIAS < .936$ | Call Drop |

Table 3: Video Line Bit rate (b=TIAS) to 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. This means that in such a case where the overall session bandwidth negotiated is less than the sum of all the media, the maximum resolution goal shown in Table 2 may not be achieved. Also, Cisco TIP devices now give customer the ability to set policy on how the entire video bandwidth is managed, so there is no guarantee that the maximum resolution goal shown in Table 3 will be achieved for a given line bit rate negotiated.

5 Summary of Changes to this document

Initial version of document; no changes.

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6 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 "Revision of the Binary Floor Control Protocol (BFCP) for use over an unreliable transport" <http://tools.ietf.org/html/draft-sandbakken-dispatch-bfcp-udp-03>
- [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>

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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 |
| SRTTP | 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 |

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