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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS
Infrastructure of audiovisual services – Communication
procedures

**Gateway control protocol: Usage of loopback
in ITU-T H.248**

Recommendation ITU-T H.248.85



ITU-T H-SERIES RECOMMENDATIONS
AUDIOVISUAL AND MULTIMEDIA SYSTEMS

| | |
|---|--------------------|
| CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS | H.100–H.199 |
| INFRASTRUCTURE OF AUDIOVISUAL SERVICES | |
| General | H.200–H.219 |
| Transmission multiplexing and synchronization | H.220–H.229 |
| Systems aspects | H.230–H.239 |
| Communication procedures | H.240–H.259 |
| Coding of moving video | H.260–H.279 |
| Related systems aspects | H.280–H.299 |
| Systems and terminal equipment for audiovisual services | H.300–H.349 |
| Directory services architecture for audiovisual and multimedia services | H.350–H.359 |
| Quality of service architecture for audiovisual and multimedia services | H.360–H.369 |
| Supplementary services for multimedia | H.450–H.499 |
| MOBILITY AND COLLABORATION PROCEDURES | |
| Overview of Mobility and Collaboration, definitions, protocols and procedures | H.500–H.509 |
| Mobility for H-Series multimedia systems and services | H.510–H.519 |
| Mobile multimedia collaboration applications and services | H.520–H.529 |
| Security for mobile multimedia systems and services | H.530–H.539 |
| Security for mobile multimedia collaboration applications and services | H.540–H.549 |
| Mobility interworking procedures | H.550–H.559 |
| Mobile multimedia collaboration inter-working procedures | H.560–H.569 |
| BROADBAND, TRIPLE-PLAY AND ADVANCED MULTIMEDIA SERVICES | |
| Broadband multimedia services over VDSL | H.610–H.619 |
| Advanced multimedia services and applications | H.620–H.629 |
| Ubiquitous sensor network applications and Internet of Things | H.640–H.649 |
| IPTV MULTIMEDIA SERVICES AND APPLICATIONS FOR IPTV | |
| General aspects | H.700–H.719 |
| IPTV terminal devices | H.720–H.729 |
| IPTV middleware | H.730–H.739 |
| IPTV application event handling | H.740–H.749 |
| IPTV metadata | H.750–H.759 |
| IPTV multimedia application frameworks | H.760–H.769 |
| IPTV service discovery up to consumption | H.770–H.779 |
| Digital Signage | H.780–H.789 |

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T H.248.85

Gateway control protocol: Usage of loopback in ITU-T H.248

Summary

Recommendation ITU-T H.248.85 clarifies the interaction between the use of the ITU-T H.248 "loopback" and the Session Description Protocol (SDP) loopback attribute. Loopback is the process where media (including transport packets) received (Local Descriptor) on a Termination is sent from the sending side (Remote Descriptor) of the Termination without the media being passed between that Termination and other Terminations in the Context.

History

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Table of Contents

| | Page |
|--|-------------|
| 1 Scope | 1 |
| 2 References..... | 1 |
| 3 Definitions | 1 |
| 3.1 Terms defined elsewhere..... | 1 |
| 3.2 Terms defined in this Recommendation..... | 1 |
| 4 Abbreviations and acronyms | 2 |
| 5 Conventions | 2 |
| 6 Loopback functionality in ITU-T H.248 | 2 |
| 6.1 Precedence..... | 3 |
| 6.2 Sending of media..... | 4 |
| 6.3 Monitoring media quality | 4 |
| Appendix I – Example use cases for loopback-based performance monitoring in RTP networks..... | 5 |
| I.1 Overview | 5 |
| I.2 Use case #1: IP-IP ITU-T H.248 MG and remote SIP UE – Loopback point located at MG ("local LP")..... | 5 |
| I.3 Use case #2: IP-IP ITU-T H.248 MG and remote SIP UE – Loopback point located at remote RTP entity ("remote LP") | 7 |
| I.4 Use case #3: Multiple IP network domains – segment-based measurements –using loopback..... | 8 |
| Bibliography..... | 10 |

Recommendation ITU-T H.248.85

Gateway control protocol: Usage of loopback in ITU-T H.248

1 Scope

This Recommendation clarifies the interaction between and use of the ITU-T H.248 "loopback" *mode* with the SDP Media Loopback functionality described by [IETF RFC 6849]. It only describes the interactions between these functionalities rather than re-describing the entire loopback procedures in [IETF RFC 6849].

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T H.248.1] Recommendation ITU-T H.248.1 (2013), *Gateway Control Protocol: Version 3*.
- [ITU-T H.248.30] Recommendation ITU-T H.248.30 (2007), *Gateway Control Protocol: RTCP extended performance metrics packages*.
- [ITU-T H.248.48] Recommendation ITU-T H.248.48 (2012), *Gateway Control Protocol: RTCP XR Block Reporting Package*.
- [IETF RFC 3550] IETF RFC 3550 (2003), *RTP: A Transport Protocol for Real-Time Applications*.
- [IETF RFC 3611] IETF RFC 3611 (2003), *RTP Control Protocol Extended Reports (RTCP XR)*.
- [IETF RFC 6849] IETF RFC 6849 (2013), *An Extension to the Session Description Protocol (SDP) and Real-time Transport Protocol (RTP) for Media Loopback*.

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 ITU-T H.248 loopback: The process where media (including transport packets) received (Local Descriptor) on a Termination is sent from the sending side (Remote Descriptor) of the Termination without the media being passed between that Termination and other Terminations in the Context.

3.2.2 ITU-T H.248 media loopback: The media traffic covers all types of media which may be described by the ITU-T H.248 Media Descriptor. This is a superset with regards to IETF loopback media traffic. The term media covers therefore not only packet-switched media traffic, but also media related to ITU-T H.248 physical terminations.

3.2.3 IETF media loopback: The media traffic is limited to "Media-over-RTP" only. The loopbacked media portion relates to the application data encapsulated in RTP packets (i.e., the RTP-SDU part).

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

| | |
|------|------------------------------|
| BGW | Border gateway |
| BR | Basic Reports |
| CP | Collection Point |
| IP | Internet Protocol |
| LP | Loopback Point |
| MG | Media Gateway |
| MGC | Media Gateway Controller |
| MP | Measurement Point |
| OP | Originating Point |
| RD | Remote Descriptor |
| RP | Reporting Point |
| RPLR | RTP Packet Loss Rate |
| RTCP | RTP Control Protocol |
| RTP | Real-Time Protocol |
| SDP | Session Description Protocol |
| SDU | Service Data Unit |
| SIP | Session Initiation Protocol |
| SR | Sender Receiver |
| UE | User Equipment |
| XR | Extended Report |

5 Conventions

Elements of the ITU-T H.248 protocol model, e.g., Context, Termination, Stream, Event, are represented using the first letter capitalized. ITU-T H.248 Property, Event, Signal and Parameter identities are given in *italics*. When used in the main text, SDP syntax is highlighted in bold i.e., "**m=**".

6 Loopback functionality in ITU-T H.248

ITU-T H.248 loopback functionality is supported through the use of the LocalControl Descriptor *Mode* Property (clause 7.1.7 of [ITU-T H.248.1]). The *mode* property is applicable to all transport types and is independent of any call control protocol used by the MGC. When a *mode* property is set to "loopback", the MG shall behave according to clause 7.1.7 of [ITU-T H.248.1]. The ITU-T H.248 loopback is a media level loopback in that the received media stream is processed according to the received Termination and may be sent in the Context (but not to other Terminations).

The *mode* property, whilst being independent of the call control variant and transport used, is used within an overall network procedure for initiating and co-ordinating loopback. Where the real-time protocol (RTP) is used, [IETF RFC 6849] describes additional SDP parameters and procedures for negotiating and initiating loopback functionality. As the ITU-T H.248.1 Local and Remote Descriptors contain SDP, this introduces an alternate means of specifying loopback functionality.

Figure 1 illustrates the example of an ITU-T H.248 Stream endpoint for traffic processing following a layered protocol architecture. Figure 1 shows that the loopback path may be "located" on different protocol layers. Such a protocol layer-dependent loopback path is either:

- implicitly given by the available media and transport information in the Local and Remote Descriptors; or
- may be explicitly indicated, like e.g., by the SDP parameters referred to in clause 6.1.

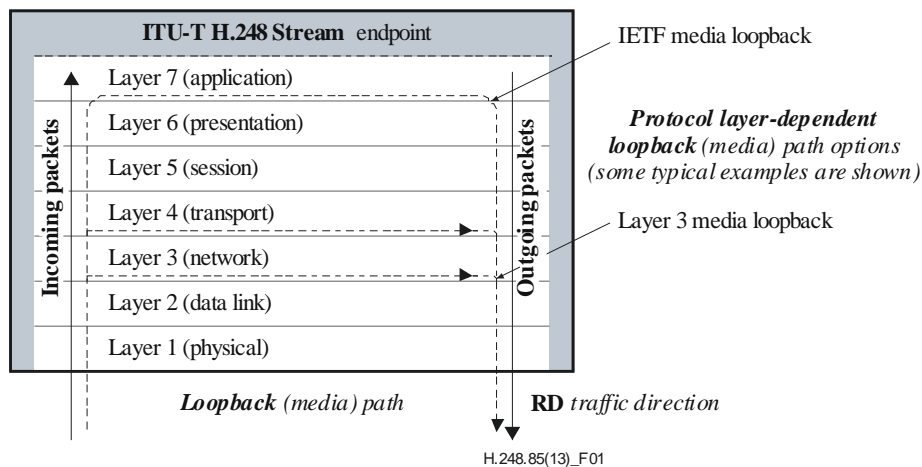


Figure 1 – Protocol layer-dependent Loopback (media) path options

6.1 Precedence

As indicated in clause 7.1.7 of [ITU-T H.248.1], there may be an interaction between the *mode* property and the contents of the Local and Remote Descriptors. The *mode* property is described as taking precedence over any mode specified by the contents of the Local and Remote Descriptors.

[IETF RFC 6849] defines procedures and attributes for both the initiating and the answering side. For the initiating side, these procedures relate to the sending of a certain RTP payload that would be controlled through the normal ITU-T H.248 "Mode" property (i.e., Send, Send/Receive) and setting the appropriate media and connection information in the Remote Descriptor. However, for the answering side, the procedures of [IETF RFC 6849] result in a change of mode behaviour and thus may conflict with the setting of the ITU-T H.248 *mode* property. Consequently, the precedence described by clause 7.1.7 of [ITU-T H.248.1] is only applicable to the "answerer" (i.e., the Termination performing the loopback, or providing the mirror).

Therefore, if the ITU-T H.248 *mode* property is set to "Inactive", "Send", "Receive", or "Send/Receive", this setting will take precedence over any SDP defined by [IETF RFC 6849] set on the answering Termination, even if **a=loopback-mirror** is set. As a result, the media or RTP packets will not be looped back (mirrored).

However, if the ITU-T H.248 *mode* property is set to "Loopback", then any SDP defined by [IETF RFC 6849] is deemed to be complementary to the ITU-T H.248 *mode*. Media or RTP packets will be looped back according to the SDP contained in the Local and Remote Descriptors.

This enables ITU-T H.248 to discriminate between a Packet or Media loopback as defined in clause 4.1 of [IETF RFC 6849].

6.2 Sending of media

[IETF RFC 6849] assumes that an SDP offer/answer exchange occurs to negotiate the use of the loopback functionality. On receipt of an answer, the MGC may then provide the Remote Descriptor of the Termination/Stream in question with the necessary media/connection information at which point the MG will start to generate packets.

6.3 Monitoring media quality

Clause 9 of [IETF RFC 6849] indicates that the use of the loopback attribute is intended for monitoring of media quality of the session. Appendix I illustrates some example use cases.

Furthermore, it states that an offering or answering entity that is compliant to this specification SHOULD support RTCP per [IETF RFC 3550] and RTCP-XR per [IETF RFC 3611]. However, this may not always be the case. Appendix I has examples of use cases that do not use RTCP and RTCP-XR, due to the fact that the measurement and reporting points are at the same location. It then details which metrics/blocks should be supported.

In order to request an MG to collect statistics regarding these metrics, the MGC should set the appropriate statistics via [ITU-T H.248.30] and/or [ITU-T H.248.48].

Appendix I

Example use cases for loopback-based performance monitoring in RTP networks

(This appendix does not form an integral part of this Recommendation.)

I.1 Overview

This appendix studies a number of example use cases with regard to the network application of loopback-based performance monitoring in RTP networks. Each use case is illustrated by a diagram. The set of considered capabilities is structured in multiple steps (e.g., measurement, reporting and/or filtering points per traffic direction) in order to point out the specific functionalities behind network performance monitoring.

I.2 Use case #1: IP-IP ITU-T H.248 MG and remote SIP UE – Loopback point located at MG ("local LP")

A measurement point (MP) is usually at the same location as the observation point. However, in case of an available transport means for transferring the concerned traffic data from the observation point to a remote location, the MP could be geographically removed from the observation point. "Loopback" is such a capability: the traffic is redirected at the loopback point (LP) in the reverse direction.

Figure I.1 depicts a use case with "media loopback" enabled at the ITU-T H.248 BGW. The ITU-T H.248 BGW provides a loopback point (LP) for RTP traffic originating from UE A. In this example, the IETF "loopback source" and "loopback mirror" roles are assigned to UE A and BGW respectively. The motivation for using an LP instead of a local MP at an ITU-T H.248 MG is elaborated in more detail in [b-ITU-T H.248.87].

The MG-assigned LP is motivated by the fact that the SIP UE is able to report measurements to control plane entities via SIP. The MG reporting capability based on ITU-T H.248 statistics ($RP_{H.248}$) is *not* used (5).

The SIP UE provides thus a RP_{SIP} (3) for the local measurements of received incoming RTP traffic (2) and mirrored RTP traffic from the BGW (1).

There is no RTCP reporting capability (for measurement data; RP_{RTCP}) required (4):

- neither from the SIP UE towards the BGW, because the ITU-T H.248 MG does not use ITU-T H.248 statistics;
- nor from the BGW towards the SIP UE, because the ITU-T H.248 MG does not produce local measurements ("lacks a local MP").

The BGW consequently is not required to support a collection point (CP) and filtering point (FP) for RTCP XR processing.

Use case "IP-IP ITU-T H.248 MG and remote SIP UE – Loopback point located at MG ("local LP")"

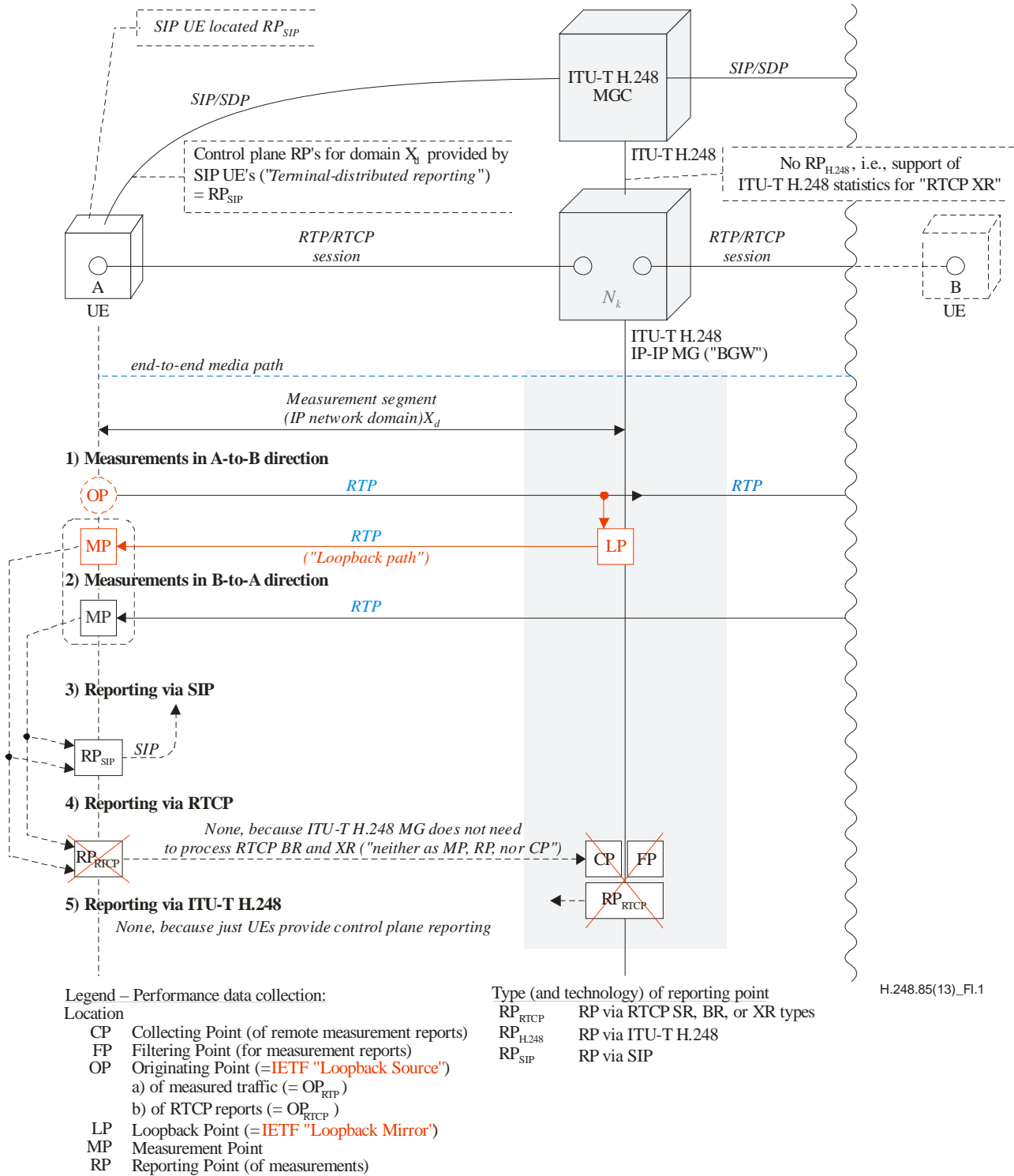


Figure I.1 – Use case #1: IP-IP H.248 MG and remote SIP UE – Loopback point located at MG ("local LP")

I.3 Use case #2: IP-IP ITU-T H.248 MG and remote SIP UE – Loopback point located at remote RTP entity ("remote LP")

Figure I.2 depicts the same network scenario, but with inverted loopback and reporting capabilities:

- SIP UE A configuration: LP (yes), RP_{SIP} (no);
- BGW configuration: LP (no), RP_{H.248} (yes).

Therefore, from the ITU-T H.248 BGW point of view, this is a use case with an enabled "media loopback" at the remote end.

The UE A provides a loopback point (LP), i.e, the IETF "loopback mirror" role, for RTP traffic originating from UE B.

The RP_{H.248} (5) is for the local measurements of originating RTP traffic (1) and mirrored RTP traffic from the UE A (2).

There is no RTCP reporting capability (for measurement data; RP_{RTCP}) required (4):

- neither from UE A towards the BGW, because the UE does not produce local measurements ("lacks a local MP").
- nor from the BGW towards UE A, because the UE does not need a control plane reporting capability ("due to the loopback usage") (Note 1).

It may be noted that the BGW provides a "virtual loopback source" role, rather than the real loopback source, which is given by the RTP end system UE B (Note 2).

NOTE 1 – The UE may need the RTCP XR data for other purposes than control plane reporting. For instance due to a management plane reporting interface, or as input data for the UE-embedded application control logic, or as output information for a local display.

NOTE 2 – Whether real or virtual loopback source would be dependent on the specific RTP topology as assigned to the BGW for this call.

Use case "IP-IP ITU-T H.248 MG and remote SIP UE – Loopback point located at remote RTP entity ("remote LB")"

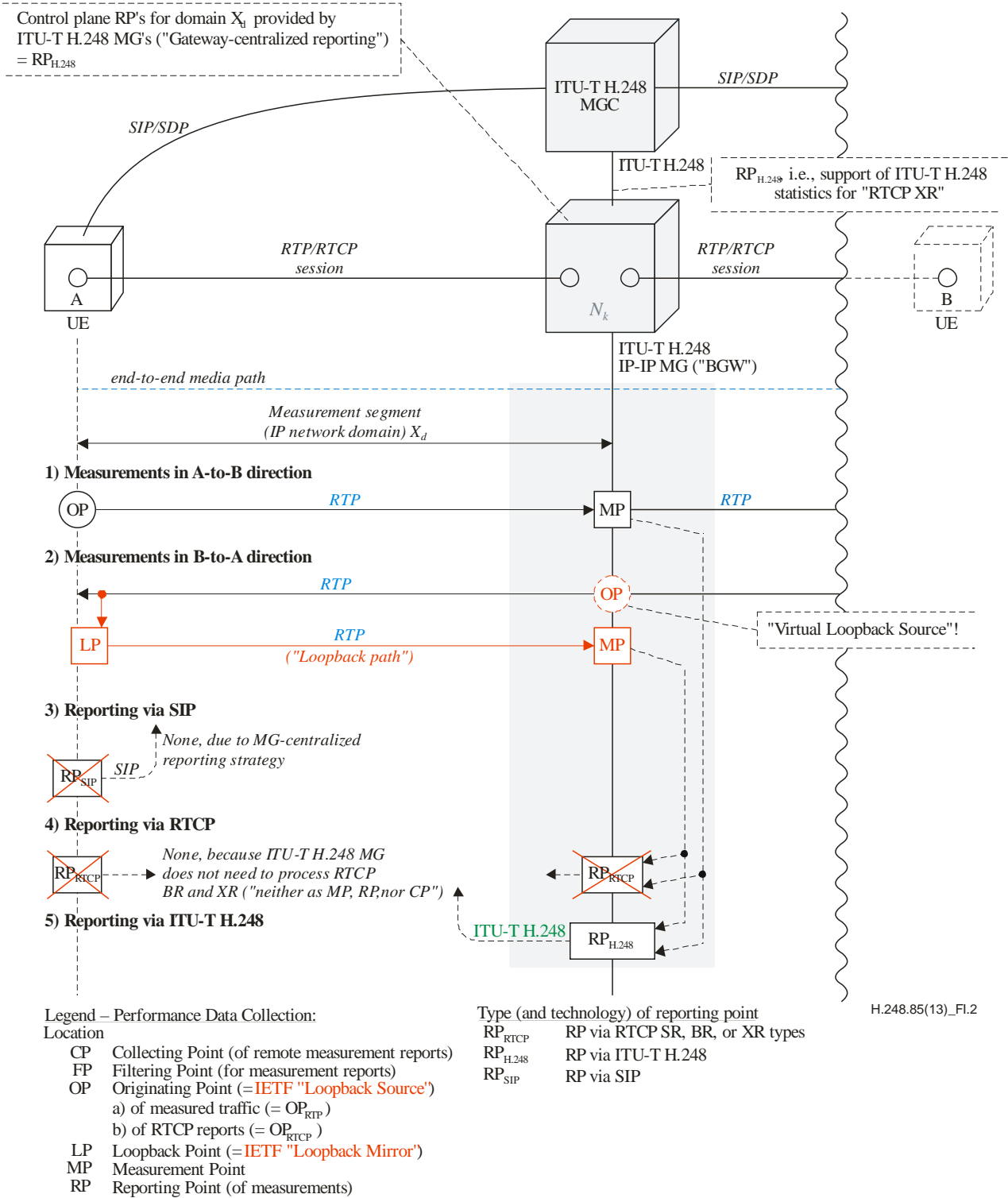


Figure I.2 – Use case #2: IP-IP H.248 MG and remote SIP UE – Loopback point located at remote RTP entity ("remote LP")

I.4 Use case #3: Multiple IP network domains – segment-based measurements – using loopback

Figure I.3 depicts a loopback scenario that serves the requirement for measuring a remote network segment by using loopback points at the network demarcations, and local MPs for each LP.

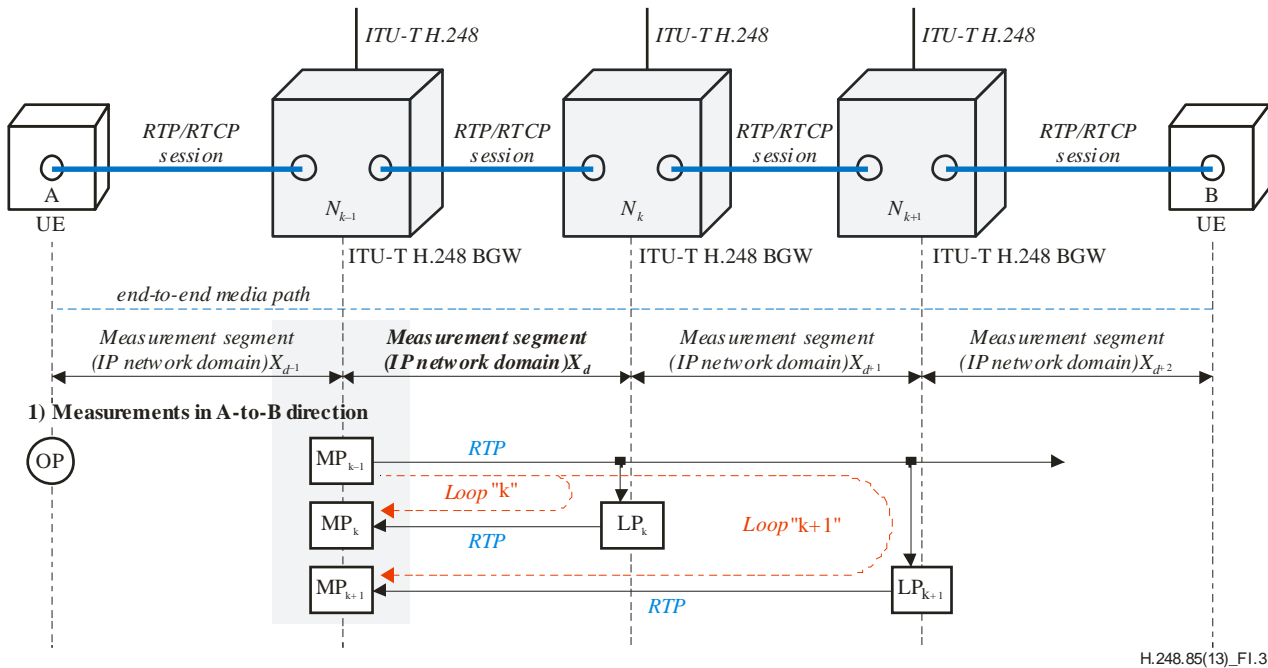


Figure I.3 – Use case #3: Multiple IP network domains – Segment-based measurements using loopback

Example:

Considering the unidirectional traffic flow from UE A (i.e., the OP) towards UE B across four IP network domains (X_{d-1} , X_d , X_{d+1} , X_{d+2}), which are bounded by three ITU-T H.248 BGWs (N_{k-1} , N_k , N_{k+1}). ITU-T H.248 BGW N_k may be used as measurement point (and control plane reporting point) in this example. There are loopback points enabled at the neighbour BGWs (LP_k and LP_{k+1}). There are then three media flows to be measured by ITU-T H.248 BGW N_k (via the three measurement points MP_{k-1} , MP_k and MP_{k+1}).

Performance metric *RTP packet loss rate* (RPLR) might be measured by the MPs, with e.g., following results: $RPLR_{k-1} = 0.3\%$, $RPLR_k = 0.4\%$ and $RPLR_{k+1} = 2.1\%$. Leading to the conclusion that the contributed packet loss would be estimated as 0.3%, 0.1% and 1.7% by IP network domains X_{d-1} , X_d and X_{d+1} , respectively.

Bibliography

- [b-ITU-T H.248.87] Recommendation ITU-T H.248.87 (2013), *Gateway control protocol: Guidelines on the use of ITU-T H.248 capabilities for performance monitoring in RTP networks in ITU-T H.248 profiles.*

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