



**Implementation Agreement for Passing RTP
QoS Metrics over H.248 from Media Plane
to Control Plane**

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MultiService Forum Implementation Agreement

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Title: Implementation Agreement for Passing RTP QoS Metrics over H.248 from Media Plane to Control Plane

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Abstract:

The MultiService Forum (MSF) is responsible for developing Implementation Agreements or Architectural Frameworks which can be used by developers and network operators to ensure interoperability between components from different vendors. MSF Implementation Agreements are formally ratified via a Straw Ballot and then a Principal Member Ballot.

Draft MSF Implementation Agreements or Architectural Framework may be published before formal ratification via Straw or Principal Member Ballot. In order for this to take place, the MSF Technical Committee must formally agree that a draft Implementation Agreement or Architectural Framework should be progressed through the balloting process. A Draft MSF Implementation Agreement or Architectural Framework is given a document number in the same manner as an Implementation Agreement.

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The use of capitalization of the key words "MUST", "SHALL", "REQUIRED", "MUST NOT", "SHOULD NOT", "SHOULD", "RECOMMENDED", "NOT RECOMMENDED", "MAY" or "OPTIONAL" is as described in section V-B of the MSF Technical Committee Operating Procedures.

The goal of the MSF is to promote multi-vendor interoperability as part of a drive to accelerate the deployment of next generation networks. To this end the MSF looks to adopt pragmatic solutions in order to maximize the chances for early deployment in real world networks.

To date the MSF has defined a number of detailed Implementation Agreements and detailed Test Plans for the signaling protocols between network components and is developing additional Implementation Agreements and Test Plans addressing some of the other technical issues such as QoS and Security to assist vendors and operators in deploying interoperable solutions.

The MSF welcomes feedback and comment and would encourage interested parties to get involved in this work program. Information about the MSF and membership options can be found on the MSF website <http://www.msforum.org/>

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I. The MultiService Forum

The MultiService Forum (MSF) is a global association of service providers, system suppliers and other organizations committed to developing and promoting open-architecture, multiservice communication systems. Founded in 1998, the MSF is an open-membership organization comprised of the world's leading telecommunications companies.

The MSF's activities include developing implementation agreements, promoting worldwide compatibility and interoperability, and encouraging input to appropriate national and international standards bodies.

As part of MSF's effort to drive and promote interoperability, the MSF has created a number of programs geared toward accelerating real world network deployments:

1. Global MSF Interoperability (GMI) events. GMI events provide a real-world setting for vendors to test their solutions and provide evidence that vendor products meet the interoperability standards set forth by MSF Implementation Agreements. Each MSF GMI event is built around a set of capabilities defined for a given release of the MSF Architecture.
2. Next Generation Network (NGN) Test Bed. The NGN test bed provides a facility to enable carriers and vendors to perform in-depth testing of a specific interface as defined in a given release of the MSF architecture.
3. Certification Programs. For more mature technologies the MSF can provide Certification of compliance to a given Implementation Agreement where MSF members believe that it is of value to the industry to do so.

II. An introduction to MSF documentation and GMI 2008

This document is part of the MSF Release 4 set of architectural, protocol and test documentation.

The MSF Release 4 Architecture is a physical implementation of the functional architectures that have been proposed by the key Standards Development Organizations. As such the MSF Release 4 Architecture represents the current state of the industry and it identifies current open interfaces between physically separate network elements.

MSF Implementation Agreements define the protocols to be used over specific open interfaces. Where possible MSF Implementation Agreements are based on industry standard protocols augmented with additional information so as to ensure interoperability between communicating network elements. This level of interoperability is achieved by closing any gaps and tightening any optional capabilities in those industry standards to remove the danger of mutually incompatible selections by vendors. An MSF Implementation Agreement is targeted at a given

release of the MSF architecture but can be used in any circumstance where an operator wishes to deploy the open interface and its functionality within their own network.

The MSF Release 4 architecture and its associated implementation agreements are used as the basis for GMI 2008. GMI 2008 is a global test event executed to demonstrate multi-vendor, multi-service interoperability based around IMS and includes IPTV and web based services.

As part of GMI 2008 a number of detailed test scenarios have been developed and a number of test plans defined. Test plans contain the set of test cases required to demonstrate a given MSF Release 4 capability and serve to exercise and validate the set of Implementation Agreements required to realize the capability.

Following the completion of GMI 2008 the MSF Release 4 architecture and individual implementation agreements will be updated if the testing identifies any deficiencies in the documents.

For more information about the scope of GMI2008 please go to <http://www.msforum.org>

III. Impact on previously published MSF documents

This is a new specification for MSF release 4 and GMI 2008.

1. Introduction

1.1 Scope

Within the MSF Release 4 Physical Architecture [7] and GMI 2008 Physical Scenarios [6], a function has been defined for transferring the RTP/RTCP metrics collected/calculated at network elements, borders, or endpoints from the media plane up to the control plane.

This function and associated interface would be applied where a distributed architecture, e.g. S-SBG-NE/D-SBG-NE or MGC/TGW, utilizes H.248 for the master/slave relationship between the control plane and media plane elements.

This IA addresses this “H.248-based RTP Metrics Transfer” function, as a part of the PM&M architecture [5] within the MSF architecture, which means the MSP reference point MI-3.

1.2 References

- | | | |
|-----|-----------------|--|
| [1] | IETF RFC 3550 | RTP: A Transport Protocol for Real-Time Applications |
| [2] | IETF RFC 3611 | RTP Control Protocol Extended Reports (RTCP XR) |
| [3] | ITU-T H.248.1 | Gateway control protocol: Version 3 |
| [4] | ITU-T H.248.30 | Gateway control protocol: RTCP extended performance metrics packages |
| [5] | MSF-2007.130.04 | Performance Management and Monitoring Architecture |
| [6] | MSF-2007.132.07 | Physical Scenarios for GMI 2008 |
| [7] | MSF-2008.045.01 | MSF Release 4 Architecture |

1.3 Abbreviations

AGW	Access Gateway
CPCP	Control Plane Collection Point
CPRP	Control Plane Reporting Point
D-SBG-NC	Data Path Session Border Gateway, Network Core
D-SBG-NE	Data Path Session Border Gateway, Network Edge
H.248	MeGaCo (Media Gateway Control Protocol)
IP	Internet Protocol
MGC	Media Gateway Controller
MOP	Media Origination Point
MPCP	Media Plane Collection Point
MPMP	Media Plane Measurement Point
MPRP	Media Plane Reporting Point
OSS	Operations & Support System
P-CSC	Proxy Call Session Controller
PM&M	Performance Monitoring & Management
PMCS	Performance Monitoring & Collection System
POTS	Plain Old Telephone System
RGW	Residential Gateway
RTP	Real-Time Protocol
S-SBG-NC	Signalling Path Session Border Gateway, Network Core
S-SBG-NE	Signalling Path Session Border Gateway, Network Edge
SIP	Session Initiation Protocol
SPDS	Session/Service-based Policy Decision Server
TGW	Trunking Gateway

2. PM&M Architecture

The H.248-based RTP Metrics transfer function operates over the MI-3 interface in the PM&M architecture in Figure 1-1.

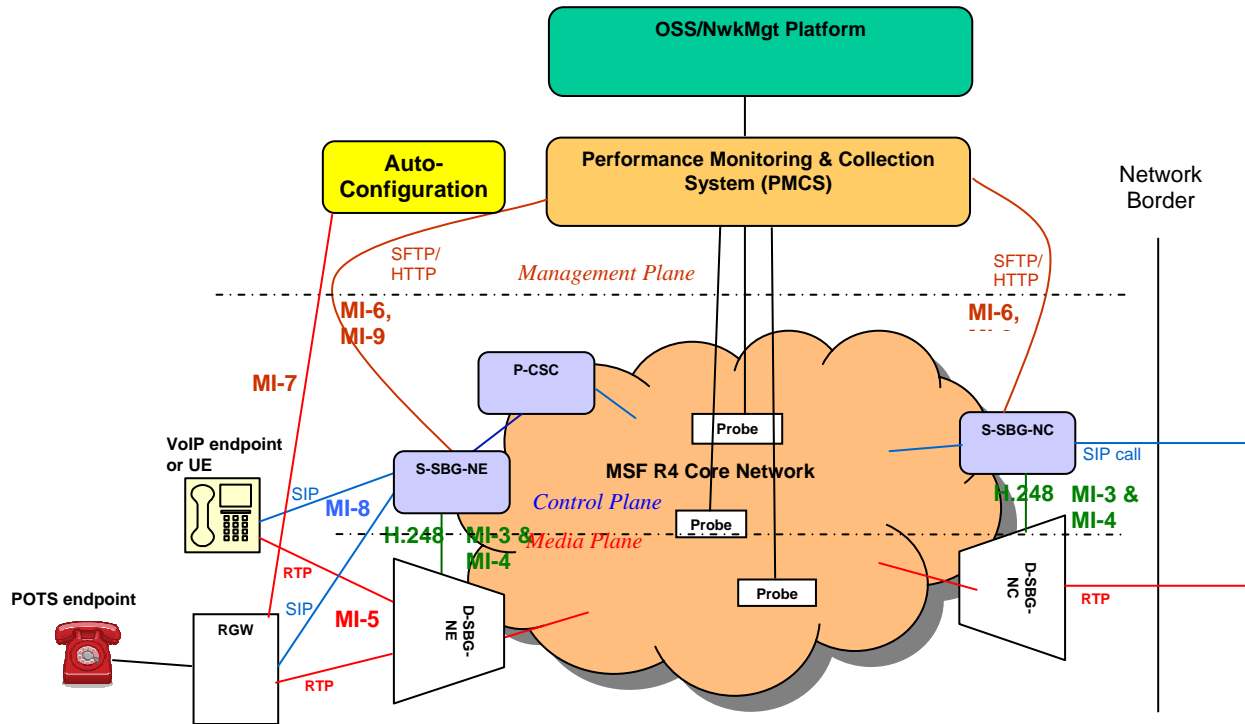


Figure 1-1: PM&M Architecture

2.1 Media Plane Reporting

In the media plane, there exist three logical functions:

1. Media Origination Point (MOP), which is the point from where the RTP and associated RTCP streams are sent from. The element with this function will also be a MPMP for bi-directional media to be able to generate the RTCP metrics for received streams
2. Media Plane Measurement Point (MPMP), which is the point where the RTP streams are analysed and near-end metrics measured, including retrieving the far-end metrics from RTCP
3. Media Plane Reporting Point (MPRP), which is the point that transmits the metrics from an element in the media plane up to an element in the control plane that contains a MPCP function

This IA does not cover the first two functions, which are covered by references [1] and [2].

The MI-3 interface operates between the MPRP and the Media Plane Collection Point (MPCP) logical functions, and is described in the rest of this IA.

2.2 Control Plane Reporting

In the control plane, from the media metrics reporting perspective, there exist two logical functions:

1. Control Plan Reporting Point (CPRP), which is the point that transmits the metrics from an element in the control plane up to an element in the management plane that contains a CPCP function
2. Control Plane Collection Point (CPCP)

This IA does not describe the control plane reporting, which includes the MI-5 and MI-6 interfaces.

2.3 MI-3 Interface

The MI-3 interface is the H.248-based RTP Metrics transfer function, which performs the following:

- Communicates which Metrics should be transmitted from the media plane element
- Collects the RTP and RTCP metrics that have been received and calculated by the media plane element
- Transmits the metrics up to the control plane element

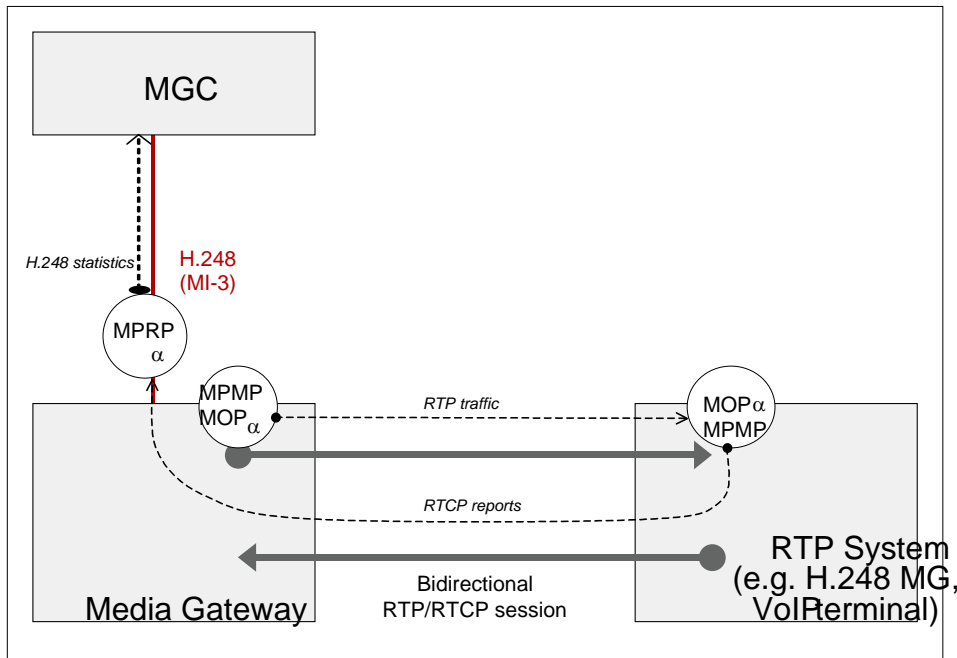


Figure 2-1 - Media Metrics and Reporting

Getting the performance metrics from the control plane to the management plane is covered by another IA for the MI-6 interface, as described in section 2.2.

3. Realization of RTP Metrics Transfer Function

Communication of what Metrics shall be transmitted, through H.248 tunnelling, shall be done by the control plane element, and include:

- the generation of specific report blocks and sub-blocks by RTP end systems and by RTP mixers
- the generation of specific report blocks and sub-blocks by RTP translators

- policies for the forwarding of specific report blocks and sub-blocks by RTP translators, including whether RTP translators forward specific report blocks which were generated by other RTP translators

3.1 Policy

Policy filtering uses a sublist of an H.248 String to define collection and permit transfer of RTCP reports as an H.248 Statistics descriptor.

This includes indicating whether RTCP XR statistics are supported or not.

3.2 Reporting

Metrics reports are tunnelled as an H.248 String, where three different report block types will be used:

- a cumulative report, sent at the end of a call or session,
- an interval session report, sent periodically (say every 30 seconds) and
- an alert or threshold report, sent when metrics drop below a specified threshold

If RTCP-XR statistics are not available (as would be the case for media plane elements that do not support RTCP-XR), then only RTP statistics will be included.

Additional RTCP-HR statistics will not be supported in this interface version.

4. Metrics Strings

4.1 RTP Statistics (Mandatory)

Statistics are sent using the RTP Package, as per [3] annex E.12.

PackageID: rtp (0x000c)

Version: 1

Extends: Network Package version 1

This package is used to support packet-based multimedia data transfer by means of the Real-time Transport Protocol (RTP) (RFC 3550).

4.1.1 RTP Translator (Optional)

PropertyID: rt (0x0002)

Description: The designation of the RTP Translator that originated the metrics report block. If not provided, then assumed to be the sender of the metrics report

Type: String

Possible values can be up to 6 alphanumeric characters.

Defined in: LocalControl

Characteristics: Read/Write

4.1.2 Packets Sent

StatisticID: ps (0x0004)

Type: double

Possible values: any 64-bit integer

4.1.3 Packets Received

StatisticID: pr (0x0005)

Type: double

Possible values: any 64-bit integer

4.1.4 Packet Loss

StatisticID: pl (0x0006)

Describes the current rate of packet loss on an RTP stream, as defined in RFC 3550. Packet loss is expressed as percentage value: number of packets lost in the interval between two reception reports, divided by the number of packets expected during that interval.

Type: double

Possible values: a 32-bit whole number and a 32-bit fraction.

4.1.5 Jitter

StatisticID: jit (0x0007)

Requests the current value of the interarrival jitter on an RTP stream as defined in RFC 3550. Jitter measures the variation in interarrival time for RTP data packets.

4.1.6 Delay

StatisticID:delay (0x0008)

Requests the current value of packet propagation delay expressed in timestamp units. Same as average latency.

4.2 RTCP XR Statistics (Optional)

Statistics are sent using the RTCP XR Base Package, as per [4] section 5, and RTCP XR Burst Metrics Package, as per [4] section 6.

4.2.1 RTCP XR Base Metrics

PackageID: rtcpxr (0x0080)

Version: 1

Extends: rtp version 1

This package defines properties and statistics to report extended quality of service metrics.

4.2.1.1 Packet Loss Concealment Type

PropertyID: plc (0x0001)

Description: The type of packet loss concealment algorithm in use.

Type: Enumeration

Possible values: "U" (0x0001) Unspecified (Default).

"D" (0x0002) Disabled – Silence insertion is being used.

"S" (0x0003) Standard.

"E" (0x0004) Enhanced.

Defined in: LocalControl

Characteristics: Read/Write

4.2.1.2 Network Packet Loss Rate

StatisticID: nplr (0x0001)

Description: The proportion of packets lost since the start of transmission expressed as an 8-bit binary fraction obtained by dividing the number of packets lost in the transmission path by the total number of packets expected and multiplying this value by 256 and taking the integer part. Thus a value of 0 would correspond to a packet loss rate of zero

and a value of 64 would correspond to a packet loss rate of 0.25 (corresponding to 25 per cent).

Type: Integer

Possible values: Any value greater than or equal to 0

4.2.1.3 Jitter Buffer Discard Rate

StatisticID: jdr (0x0002)

Description: The proportion of packets discarded by the receiving jitter buffer since the start of transmission expressed as an 8-bit binary fraction obtained by dividing the number of packets discarded by the total number of packets expected and multiplying this value by 256 and taking the integer part.

Type: Integer

Possible values: Any value greater than or equal to 0

4.2.1.4 RTCP Round-Trip Delay

StatisticID: rtd (0x0003)

Description: The round-trip delay between the RTP interfaces on the local and remote MGs.

Type: Integer

Possible values: Any value greater than or equal to 0 in milliseconds

4.2.1.5 End System Delay

StatisticID: esd (0x0004)

Description: The end system delay, comprising encode, decode and jitter buffer delay. This may be combined with the RTCP Round-Trip Delay to estimate the overall Voice over IP segment round-trip delay.

Type: Integer

Possible values: Any value greater than or equal to 0 in milliseconds

4.2.1.6 Signal Level

StatisticID: sl (0x0005)

Description: The ratio of the signal level to a 0 dBm0 reference.

Type: Integer

Possible values: Any value in dB

4.2.1.7 Noise Level

StatisticID: nl (0x0006)

Description: The ratio of the silent period background noise level to a 0 dBm0 reference.

Type: Integer

Possible values: Any value less than or equal to 0 in dB

4.2.1.8 Residual Echo Return Loss

StatisticID: rerl (0x0007)

Description: The echo return loss after the effects of echo cancellation.

Type: Integer

Possible values: Any value greater than or equal to 0 in dB.

4.2.1.9 R Factor

StatisticID: ns (0x0008)

Description: A value representing the receiving end call quality of the RTP stream terminated by this termination, calculated per ITU-T Rec. G.107. Table 1/G.108 provides interpretive information about the value of the R factor.

Type: Integer

Possible values: Any value between 0 and 100

4.2.1.10 External R Factor

StatisticID: ns (0x0009)

Description: A value representing the effects of any call segment carried over a network segment external to the RTP stream terminated by this termination, calculated per ITU-T Rec. G.107. Table 1/G.108 provides interpretive information about the value of the R factor.

Type: Integer

Possible values: Any value between 0 and 100

4.2.1.11 Estimated MOSLQ

StatisticID: lq (0x000a)

Description: An estimated receiving end Listening Quality MOS, calculated per ITU-T Rec. G.107 and multiplied by 10 as described in IETF RFC 3611.

Type: Integer

Possible values: Any value between 10 to 50

4.2.1.12 Estimated MOSCQ

StatisticID: cq (0x000b)

Description: An estimated receiving end Conversational Quality MOS, calculated per ITU-T Rec. G.107 and multiplied by 10 as described by IETF RFC 3611.

Type: Integer

Possible values: Any value between 10 and 50

4.2.2 RTCP XR Burst Metrics

PackageID: xrbm (0x0081)

Version: 1

Extends: rtcpxr version 1

This package defines properties and statistics for reporting burst metrics.

4.2.2.1 Minimum Gap Threshold

PropertyID: gmin (0x0002)

Description: A parameter used to define bursts. This is by default set to 16, which sets the threshold packet loss rate between bursts and gaps to approximately 6%. See the procedures for how to use Gmin to determine a burst. Gmin shall not be altered once the RTP stream is established. Attempts to do so should result in the MG returning error xxx.

Type: Integer

Possible values: Any positive integral value, defaults to 16

Defined in: LocalControl

Characteristics: Read/Write

4.2.2.2 Burst Loss Density

StatisticID: bld (0x000c)

Description: The average proportion of packets both lost and discarded during burst periods expressed as an 8-bit binary fraction. This is obtained by dividing the sum of the number of packets lost in the transmission path and discarded by the jitter buffer during burst periods by the total number of packets expected during burst periods, multiplying this value by 256 and taking the integer part.

A burst is a period during which a high proportion of packets are either lost in transit or discarded due to late arrival. In general, a burst is likely to result in audible degradation to call quality.

Type: Integer

Possible values: Any integral value greater than or equal to 0

4.2.2.3 Burst Duration

StatisticID: bd (0x000d)

Description: The average length of burst periods.

Type: Integer

Possible values: Any integral number of milliseconds greater than or equal to 0

4.2.2.4 Gap Loss Density

StatisticID: gld (0x000e)

Description: The average proportion of packets lost and discarded during gap periods expressed as an 8-bit binary fraction. This is obtained by dividing the sum of the number of packets lost in the transmission path and discarded by the jitter buffer during gap periods by the total number of packets expected during gap periods, multiplying this value by 256 and taking the integer part.

Type: Integer

Possible values: Any integral value greater than or equal to 0

4.2.2.5 Gap Duration

StatisticID: gd (0x000f)

Description: The average length of gap periods.

Type: Integer

Possible values: Any integral number of milliseconds greater than or equal to 0

4.2.3 RTCP XR Burst Metrics Procedures

For the purposes of calculating the RTCP XR Burst statistics above:

A burst is defined as the longest sequence that:

- a) starts with a lost or discarded packet;
- b) does not contain any occurrences of consecutive received (and not discarded) packets numbering greater than or equal to the Gmin property value; and
- c) ends with a lost or discarded packet.

A gap is defined as any of the following:

- a) the period from the start of an RTP session to the receipt time of the last received packet before the first burst;
- b) the period from the end of the last burst to either the time of the report or the end of the RTP session, whichever comes first; or
- c) the period of time between two bursts.