



**Implementation Agreement for IPTV Video  
Performance Management**

**MSF-IA-RTCP.001-FINAL**

# MultiService Forum Implementation Agreement

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**Editor:** Claire Mandeville, Iometrix

[claire@iometrix.com](mailto:claire@iometrix.com)

+1 415 425 0720

**Working Group Chairperson:** Lily Chen

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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.

Draft Implementation Agreements may be revised before or during the full balloting process. The revised document is allocated a new major or minor number and is published. The original Draft Implementation Agreement or Architectural Framework remains published until the Technical Committee votes to withdraw it.

After being ratified by a Principal Member Ballot, the Draft Implementation Agreement or Architectural Framework becomes final. Earlier Draft Implementation Agreements or Architectural Frameworks remain published until the Technical Committee votes to withdraw them.

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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**For addition information contact:**

MultiService Forum  
48377 Fremont Blvd., Suite 117  
Fremont, CA 94538 USA  
Phone: +1 510 492-4050  
Fax: +1 510 492-4001  
[info@msforum.org](mailto:info@msforum.org)  
<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 for IPTV Video Performance Management**

The Performance Management Group has identified the need to measure video performance for IPTV. The Performance Management Group's objective is to demonstrate IPTV video performance and the capability to report those metrics as part of GMI 2008 and therefore to select some IPTV video metrics.

The MSF can use IPTV video metrics defined in "RTCP XR – Report Block for IPTV Metrics (draft-venna-avt-rtcp-iptv-02)" for video performance management.

## **2. Applicability and Scope**

As described in "RTCP XR – Report Block for IPTV Metrics (draft-venna-avt-rtcp-iptv-02)," IPTV video metrics help understand the short-term performance of the IPTV service as well as long-term indicators for network configuration.

The goal of this implementation agreement is to propose IPTV video metrics to monitor IPTV video performance selected from the document mentioned above and to propose a way to report those metrics by using a new report block for the Extended Report (XR) packet type of the RTP Control Protocol (RTCP) defined in the document mentioned above.

Only metrics related to IPTV video performance defined in the document mentioned above are considered.

## **3. Assumptions**

The metrics described below are to be considered to report IPTV video performance management for GMI 2008, but are not necessarily to be selected. The selection of the metrics will depend on the test case scenarios as well as the means there exists to report them.

## **4. Protocol Definition**

"RTCP XR – Report Block for IPTV Metrics (draft-venna-avt-rtcp-iptv-02)" defines a new report block for the Extended Report (XR) packet type of the RTP Control Protocol (RTCP) defined in RFC 3550 that allows IPTV clients to report to a server on various aspects of the stream that is being delivered to them.

The new reporting blocks defined in this internet draft report metrics from various encapsulations and views of the media stream - RTP, MPEG-2 TS, Programs, Elementary Streams.

The IPTV Metrics Report Block defined in “RTCP XR – Report Block for IPTV Metrics (draft-venna-avt-rtcp-iptv-02)” is composed of a main report block and two sub-blocks: the Main Block, the Program Sub-block, the Elementary Stream Sub-block.

The Main Block is composed of performance metrics related to RTP traffic, the Program Sub-block is composed of metrics related to programs and channel change and the Elementary Stream Sub-block is composed of metrics related to elementary streams, which are usually the output of an audio or video encoder.

Packets in the Program Sub-block and the Elementary Stream Sub-block refer to TS (Transport Stream) packets. Packets in the Main Block refer to RTP packets.

## 5. IPTV Video Metrics Selected

### Main Block IPTV Metrics

- Begin\_rtp\_seq (16 bits): the first RTP sequence number that this block reports on.
- End\_rtp\_seq (16 bits): the last RTP sequence number that this blocks reports on plus one.
- Duplicate RTP packets (16 bits): the number of duplicate RTP packets received in the above sequence number interval.
- Out of order RTP packets (16 bits): the number of out-of-order RTP packets received in the above sequence number interval.
- Lost RTP packets (16 bits): the number of lost RTP packets in the above sequence number interval.
- Noticeable lost RTP packets (16 bits): The number of noticeable lost RTP packets as defined in RFC 3357. The loss constraint is specified later.
- Min RTP jitter (16 bits): the minimum jitter of received RTP packets in the above sequence specified in milliseconds.
- Max RTP jitter (16 bits): the maximum jitter of received RTP packets in the above sequence specified in milliseconds.
- Avg RTP jitter (16 bits): The average jitter of received RTP packets in the above sequence specified in milliseconds.
- Std deviation of RTP jitter (16 bits): the standard deviation of jitter of received RTP packets in the above sequence specified in milliseconds.
- # of RTP loss periods (16 bits): the number of loss periods in the above sequence as defined in [RFC3357] for RTP packets.
- Min RTP loss period size (16 bits): the number of RTP packets lost in the loss period of the smallest size.

- Max RTP loss period size (16 bits): the number of RTP packets lost in the loss period of the largest size.
- Avg RTP loss period size (16 bits): the avg number of RTP packets lost in each of the loss periods.
- # of First Priority Errors (16 bits): the number of first priority errors in the MPEG-2 TS as specified in ETSI TR 101 290. This includes Sync loss errors, Sync byte errors, PAT errors, Continuity counter errors, PMT errors, and PID errors.
- # of Second Priority Errors (16 bits): the number of second priority errors in the MPEG-2 TS as specified in ETSI TR 101 290. This includes TS errors, CRC errors, PCR errors, PTS errors, and CAT errors.
- Max PAT gap (16 bits): the maximum gap between two successive PAT pkts in milliseconds. This metric is related to channel change time.
- Avg PAT gap (16 bits): the average gap between two successive PAT pkts in milliseconds. This metric is related to channel change time.
- # of programs (16 bits): the total number of programs carried in this transport stream. For each program, a separate block is reported.
- Loss constraint (8 bits): the value of loss constraint used to compute noticeable lost RTP packets.

## Program Sub-block IPTV Metrics

- Max PMT gap (16 bits): the maximum gap between two successive PMT pkts in milliseconds. This metric is related to channel change time.
- Avg PMT gap (16 bits): the average gap between two successive PMT pkts in milliseconds. This metric is related to channel change time.
- Max PCR gap (16 bits): the maximum gap between two successive pkts that have a PCR in them.
- Avg PCR gap (16 bits): the average gap between two successive pkts that have a PCR in them.
- Min PCR jitter (16 bits): the minimum jitter of PCR clock in the above sequence specified in milliseconds.
- Max PCR jitter (16 bits): the maximum jitter of PCR clock in the above sequence specified in milliseconds.
- Avg PCR jitter (16 bits): the average jitter of PCR clock in the above sequence specified in milliseconds.

- Std deviation of PCR jitter (16 bits): the standard deviation of the jitter of PCR clock in the above sequence specified in milliseconds.
- Start time (32 bits): the middle 32 bits of the 64 bits of the NTP timestamp when the presence of this program was first detected.
- Stop time (32 bits): the middle 32 bits of the 64 bits of the NTP timestamp when the presence of this program was terminated. If the program is still running, it should be set to 0.
- # of program packets (16 bits): the number of packets in the above sequence that belong to this program.
- # of ES (16 bits): the total number of ES that belong to this program. For each ES, a separate block is reported.

## Elementary Stream Sub-block

- Number of PES Pkts (16 bits): the number of TS pkts that belong to this ES.
- Number of Frames (16 bits): the number of frames received for this ES.
- Complete Frames Lost (16 bits): the number of complete frames lost for this ES.
- Duplicate packets (16 bits): the number of duplicate packets received in the above sequence number interval.
- Out of order packets (16 bits): the number of out-of-order packets received in the above sequence number interval.
- Lost packets (16 bits): the number of lost packets in the above sequence number interval.
- Partial Frames Rcvd (16 bits): the number of partial frames rcvd for this ES.
- # of loss periods (16 bits): the number of loss periods in the above sequence as defined in [RFC3357].
- Min loss period size (16 bits): the number of packets lost in the loss period of the smallest size.
- Max loss period size (16 bits): the number of packets lost in the loss period of the largest size.
- Avg loss period size (16 bits): the avg number of packets lost each of the loss periods.
- Noticeable lost packets (16 bits): the number of noticeable lost packets as defined in [RFC3357]. The loss constraint is specified later.

- Loss constraint (8 bits): the value of loss constraint used to compute noticeable lost packets.
- Start time (32 bits): the middle 32 bits of the 64 bits of the NTP timestamp when the presence of this program was first detected.
- Stop time (32 bits): the middle 32 bits of the 64 bits of the NTP timestamp when the presence of this program was terminated. If the program is still running, it should be set to 0.

## **6. References**

RTCP XR - Report Block for IPTV Metrics (draft-venna-avt-rtcp-iptv-02)  
RFC 3550 - RTP: A Transport Protocol for Real-Time Applications  
RFC 3611 - RTP Control Protocol Extended Reports (RTCP XR)  
RFC 2250 - RTP Payload Format for MPEG1/MPEG2 Video