MSF Implementation Agreement for Xd interface between MDF and UE for IMS-based IPTV

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MultiService Forum

Implementation Agreement

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Abstract:

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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 Implementation Agreement for MSF release 4 and GMI 2008

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1 Introduction

Streaming refers to the ability of an application to play synchronised media streams like audio and video streams in a continuous way while those streams are being transmitted to the client over a data network.

The IPTV content is transported over the IP network. In order to do so, encapsulation and transport protocols are specified in this document to allow simple interoperability testing between different vendor's MDF and UE.

2 Scope

This document defines the implementation agreement for MDF and UE's Encapsulation scheme and Transmission scheme and AL-Qos for Video which over IP Transmission within the MSF Architecture, Release 4.

3 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.

[1] ISO/IEC 13818-1 (1996): "Information technology - Generic coding of moving pictures and associated audio information: Systems".

[2] ETSI TS 183 063: "Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN);IMS based IPTV Stage 3 Specification"

[3] SMPTE Specification 2022-1: Forward Error Correction for Real-time Video/Audio Transport Over IP Networks.

[4] ETSI TS 182 027: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IPTV Architecture; IPTV functions supported by the IMS subsystem".

[5] ETSI TS 102034 v1.3.1 Transport of MPEG 2 Transport Stream (TS) Based DVB Services over IP Based Networks

[6] RFC 4585 - Extended RTP Profile for Real-time Transport Control Protocol (RTCP)-Based Feedback (RTP/AVPF)

[7] RFC 4588 -RTP Retransmission Payload Format

[8] MSF2008.139.01 "MSF IMS-IPTV Physical Architecture for GMI08"

4 Definitions and Abbreviations

4.1 Definitions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", “NOT RECOMMENDED”, "MAY", "OPTIONAL", “CONDITIONAL” and “IF” in this document are to be interpreted as described in the MSF Technical Committee Operating Procedures..

4.2 Abbreviations

ALC	Asynchronous Layered Coding
AL-FEC	Application Layer Forward Error Correction
ARQ	Automatic Repeat request
ATIS IIF	Alliance for Telecommunication Industry Solutions - IPTV Interoperability Forum
AVP	Audio-Visual Profile
FEC	Forward Error Correction
IP	Internet Protocol
IPTV	Internet Protocol TeleVision
MDF	Media Delivery Function
MPEG	Moving Pictures Experts Group
NACK	Negative ACKnowledgement
QoS	Quality of Service
RTCP	Real-Time Control Protocol
RTP	Real-Time Protocol
TS	Transport Stream
UDP	User Datagram Protocol
UE	User Equipment

5 Xd interface description

Figure 1 illustrates the diagram given in [4] showing the Xd interface for IMS based IPTV system. And Figure 2 is given in MSF [8] showing the Xd interface.This Xd reference point (for media delivery) is a logical end-to-end reference point between the UE and the IPTV Media Delivery Function that is used to deliver media data.

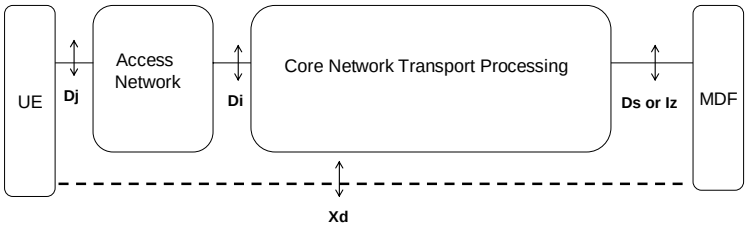

Figure 1 : Decomposition of the Xd reference point

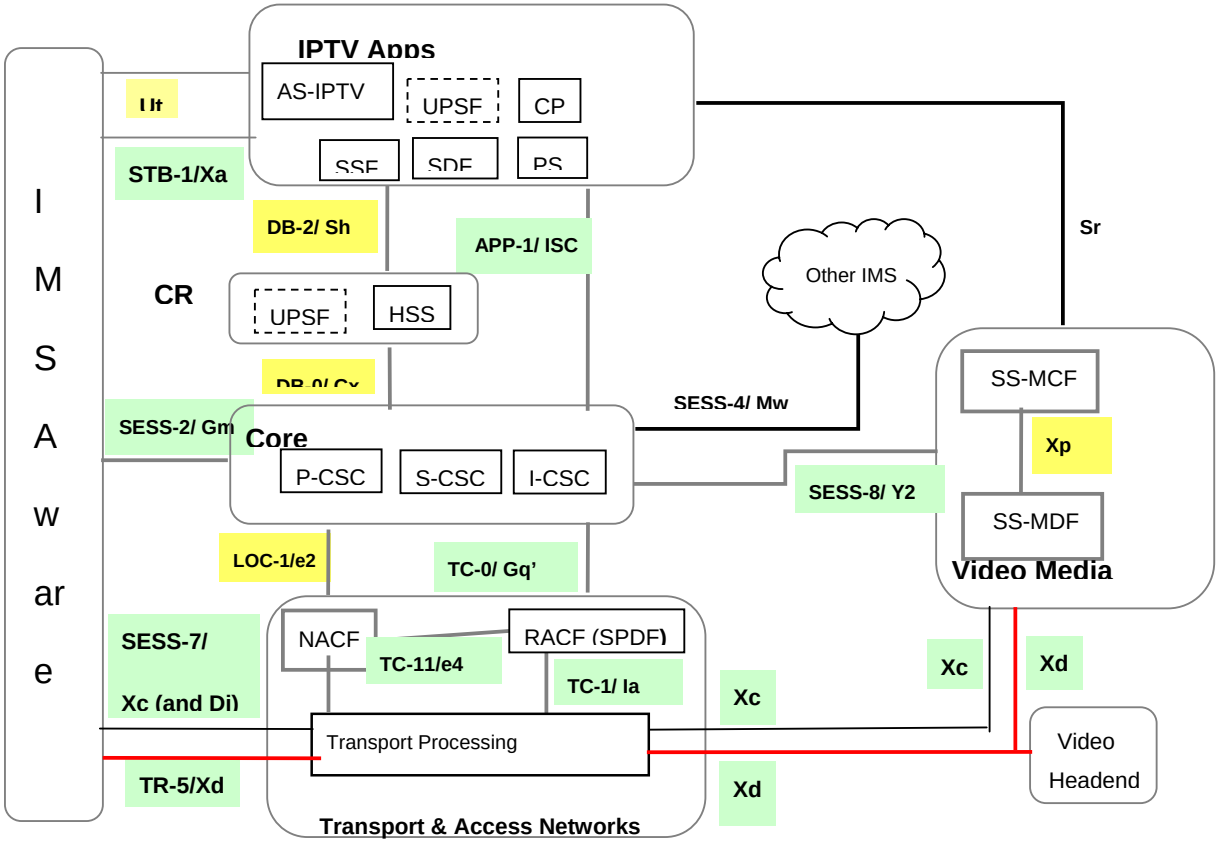

Figure 2 : Xd interface between UE and SS-MDF/Headend

6 Streaming Encapsulation and Transport Protocols Stack

Figure 3 is a logical diagram of the high-level protocols on the Xd interface, specified in the present document for enabling media content over IP-based networks. The organization of this protocol stack is according to the ISO/OSI layering convention. .
The present document specifies the protocols required for transport of elements of the service offering via IP networking, in principle independent of the physical layers below the IP networking layer.

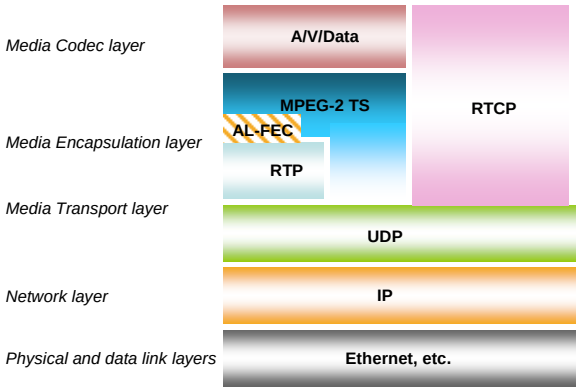

Figure 3 : Functional Layers for Xd interface

The Audio and Video streams are multiplexed into a valid MPEG-2 Transport Stream, according to ISO/IEC 13818-1 [1]. The resulting MPEG-2 packets are encapsulated directly in UDP or in RTP\UDP. RTCP is used to send information regarding transmission statistics.

The MDF may be able to send the content encapsulated into MPEG2-TS(RECOMMENDED).In that case, one of the following shall be used:

- The transport of the IPTV content within MPEG2TS layer over RTP shall be done conforming to ETSI TS 102034 [5], clause 7.1.1.(RECOMMENDED)
- The transport of the IPTV content within MPEG2TS layer over UDP shall be done conforming to ETSI TS 102034 [5], clause 7.1.2. (Optional)

Note: The MDF may be able to send the content directly over the RTP layer (e.g. H264 over RTP).

For Media Codec layer, H.264 shall be supported for video codec and AAC shall be supported for audio codec.
Standard definition resolution shall be supported for video and stereo shall be supported for audio.

7 Application layer Qos

Streaming video traffic transported over a packet-based network may become corrupted in transit, or may be dropped at a router when traffic has become congested. Streaming video can tolerate some data loss, but too much loss can produce a poor quality.

By adding redundant data to a media stream, FEC can be used to repair the damage to the media stream due to packet loss. FEC does not have the problem of implosion from retransmission requests in various multicast scenarios.

However, FEC adds overhead to the media stream. More complex FEC will provide better protection, But too much FEC overhead will introduce the chance of congestion.. The complexity in encoding and decoding FEC data is also costly at both the sender and receiver.

ARQ is another way to repair the damage to the media stream due to packet loss. Receivers(here is UE) use a back channel to the sender to send requests for retransmission of lost packets.

ARQ works well for one-to-one reliable protocols, as evidenced by the pervasive success of TCP/IP.

ARQ also works well for one-to-many reliable protocols, but limited group.

7.1 Procedure for Real-Time Transport Error Correction

When MDF supports the transport error correction mechanism, FEC is recommended and ARQ is optional.

7.1.1 Unidirectional Transport Error Correction

For unidirectional transport error correction the MDF shall use an application Layer FEC mechanism , conforming to ETSI TS 102 034 [5], annex E.
NOTE: Only the base layer of the DVB-IP AL-FEC is supported in this release, the enhancement layer support is out of scope, according to ETSI TS 183 063 [2], clause 11.1.2.1
.

7.1.2 Procedure for ARQ

Real-time media streams that use RTP are, to some degree, resilient against packet losses. UE may use the base mechanisms of the Real-time Transport Control Protocol (RTCP) to report packet reception statistics and thus allow MDF to adapt its transmission behavior. But that’s not enough. Immediate feedback from UE to MDF may allow for immediately adaptation and efficient feedback-based repair according to RFC 4585 [6].

UE shall use the NACK feedback message format defined in RFC 4585 [6] for requesting the retransmission of RTP packets.

MDF or UE implementing RTP retransmission shall implement the payload format, SDP signalling and mechanisms of the RTP retransmission payload format according to RFC 4588 [7].

The RTP retransmission payload format in RFC 4588 [7] provides two different schemes for multiplexing the original and the retransmission stream, i.e. session-multiplexing and SSRC-multiplexing. MDF or UE shall use SSRC-multiplexing and shall not use session-multiplexing.