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INFORMATION TECHNOLOGY – MOBILE MULTICAST COMMUNICATIONS: FRAMEWORK

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**INFORMATION TECHNOLOGY –
MOBILE MULTICAST COMMUNICATIONS: FRAMEWORK**

SUMMARY

This Recommendation | International Standard describes the framework of Mobile Multicast Communications (MMC). MMC is intended for real-time, one-to-many multicast services and applications over mobile communications networks. This Recommendation | International Standard specifies the design principles, functional architecture, and high-level information flows for MMC over wireless mobile networks.

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KEYWORDS

Mobile Multicast Communication, Wireless/Mobile Network, IP Multicasting, Overlay Multicasting, Framework

FOREWORD

ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) established the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of the technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations -- be they government or non-government -- also take part in the work in liaison with ISO and IEC. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

ISO/IEC 24793 consists of the following parts under the general title Information Technology — Mobile Multicast Communications:

- Part 1: Framework (ITU-T X.604 | ISO/IEC 24793-1, MMC-1)
- Part 2: Protocol over Native IP Multicast Networks (ITU-T X.604.1 | ISO/IEC 24793-2, MMC-2)
- Part 3: Protocol over Overlay Multicast Networks (ITU-T X.604.2 | ISO/IEC 24793-3, MMC-3)

1. SCOPE

This Recommendation | International Standard describes the Mobile Multicast Communications (MMC), which can be used to support a variety of multimedia multicasting services in IP-based wireless mobile networks as well as wired fixed networks. MMC targets real-time, one-to-many multicast services and applications over mobile communications networks. This implies that MMC focuses on multicast services rather than broadcast services, and that only authenticated users could be allowed in the multicast session. MMC also considers the one-to-many multicast session wherein a single multicast sender is allowed in the session rather than many-to-many multicast services. In addition, MMC is targeted in the real-time multicast session rather than the reliable multicast session; the timely delivery of multicast data is considered a key factor.

This Recommendation | International Standard specifies the MMC framework as part of the MMC standard describing the framework and functional architecture of MMC. Based on this framework, the two protocols for MMC will be developed in two parts of the MMC project: protocol over native IP multicast networks and protocol over overlay multicast networks.

2. NORMATIVE REFERENCES

The following ITU-T Recommendations and International Standards contain provisions that, through references in the text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations | International Standards listed below. ISO and IEC members maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU-T maintains a list of currently valid ITU-T documents.

- a) ITU-T Recommendation X.603 (2004) | ISO/IEC 16512-1 (2004), Information Technology — Relayed Multicast Protocol (RMCP): Framework
- b) ITU-T Recommendation X.603.1 (2007) | ISO/IEC 16512-2 (2007), Information Technology — Relayed Multicast Protocol (RMCP): Specification for Simplex Group Applications

The following IETF standard track RFCs specify the multicast forwarding capability in IP multicast networks:

- c) IETF RFC 2236 (1997), Internet Group Management Protocol Version 2 (IGMPv2), Proposed Standard
- d) IETF RFC3810 (2004), Multicast Listener Discovery Version 2 (MLDv2) for IPv6, Proposed Standard
- e) IETF RFC 4601 (2006), Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification, Proposed Standard

3. DEFINITIONS

This Recommendation | International Standard uses the terms defined in the Relayed Multicast Protocol (ITU-T Rec. X.603 | ISO/IEC 13252). The following terms are also used in this Recommendation | International Standard:

- a) **Multicast Network**
Multicast Network refers to any of the networks wherein legacy IP multicasting schemes are enabled with the help of multicast routing protocols, multicast forwarding capability of multicast routers in the networks, link-layer multicasting of the points of attachment in the network, and multicast membership signaling in the subnet such as IGMP/MLD. MMC services could be provisioned over the Multicast Network.
- b) **Overlay Multicast Network**
An overlay multicast network pertains to a network wherein legacy IP multicasting schemes are not fully supported. In this network, multicast application data are delivered using unicast transport such as TCP, UDP, or IP-in-IP tunneling schemes. In particular, the unicast delivery of multicast data may be done in backbone networks. In the overlay multicast network, IP multicast transport may be used in a portion of the network. For example, as shown in the RMCP protocol (ITU-T X.603 | ISO/IEC 16512), subnet multicasting may be used in

the end subnets where the multicast sender or receiver is located. In the overlay multicast network, multicast data may be delivered using the unicast relay of multicast agents and subnet multicasting capability. MMC services could be provisioned over the overlay multicast network.

4. ABBREVIATIONS

AAA	Authentication, Authorization, and Accounting
AS	Authentication Server
BCMCS	Broadcast Multicast Services
BWA	Broadband Wireless Access
MCS	Multicast Contents Server
ECTP	Enhanced Communications Transport Services
FMC	Fixed Mobile Convergence
IGMP	Internet Group Management Protocol
IP	Internet Protocol
IPTV	IP-based TV
MA	Multicast Agent
MBMS	Multimedia Broadcast Multicast Services
MLD	Multicast Listener Discovery
MMC	Mobile Multicast Communications
MMCF	MMC Framework
MN	Mobile Node
NGN	Next-Generation Networks
RMCP	Relayed Multicast Protocol
SM	Session Manager
SDO	Standard Defining Organization
WLAN	Wireless Local Area Network

5. INTRODUCTION

This Recommendation | International Standard deals with Mobile Multicast Communications (MMC). MMC is targeted to enable and support a variety of multimedia multicast applications and services over the wireless/mobile networks as well as the wired/fixed networks.

This document describes the MMC Framework (MMCF). Based on this framework, the two protocols required for MMC will be developed. This clause will first describe the rationale for MMC from the perspective of market trends and evolving network environments. In addition, some related works that have been made in other SDOs will be reviewed.

5.1 MARKET TRENDS

From the market perspective, the work on MMC is driven by the following observations:

- a) Growth of IP-based multimedia broadcast/multicast services markets
In telecommunications markets, there is a crucial need to provide multimedia multicasting and broadcasting services all over the world. With the help of broadband networks, efficient multimedia platforms including

audio/video codecs, and IP-based network transport and application technologies, the markets for IP-based multimedia broadcasting and multicasting services are expected to grow in next-generation communications networks.

Examples of these multimedia multicast/broadcast services include Internet TV (IPTV), remote education, broadcasting of special live events, etc.

b) Increasing needs of multimedia broadcast/multicast services over wireless mobile networks

The recent trend in the mobile communications industry reflects the increasing demands of multimedia multicast/broadcast applications and services over wireless/mobile networks. In fact, IP-based multimedia broadcasting/multicasting services will be some of the primary killer applications from the perspective of mobile services providers.

Examples of these mobile multicast applications/services include mobile IPTV, mobile commerce (m-commerce), and Digital Multimedia Broadcasting (DMB) using mobile devices such as cellular phone, PDA, handheld PCs, etc. These mobile multicasting services are expected to be provisioned through a variety of wireless access networks such as cdma2000, W-CDMA, Wireless LAN (WLAN) based on IEEE 802.11, and Broadband Wireless Access (BWA) based on IEEE 802.16. Most of the mobile service providers are expected to provide IP-based multimedia multicasting services over these various wireless networks.

c) MBMS and BCMCS standardizations in 3GPP and 3GPP2

Given the demand for mobile multicasting, 3GPP and 3GPP2 are working on standardization to develop the relevant protocols or schemes. In 3GPP, the “Multimedia Broadcast and Multicast Services (MBMS)” is being developed to support IP-based multimedia multicasting services in its own systems. On the other hand, 3GPP2 started to come up with standardization works on the “Broadcast & Multicast Services (BCMCS)” for their own cdma2000-based networks and systems.

5.2 NETWORK ENVIRONMENTS

In next-generation communications networks, a variety of heterogeneous access networks using different wireless/wired access technologies are expected to coexist under the same administrative domain or network operator. In this environment, those heterogeneous access networks may be interconnected with each other via the IP-based core network; thus ensuring that identical multimedia multicast/broadcast services could be provided to users regardless of the access network where the user is connected.

With this trend of Fixed-Mobile Convergence (FMC), there is a crucial need to provide multimedia multicasting services/applications over wireless/mobile networks as well as wired/fixed communications networks.

The following figure illustrates the network environment to be considered in the MMC.

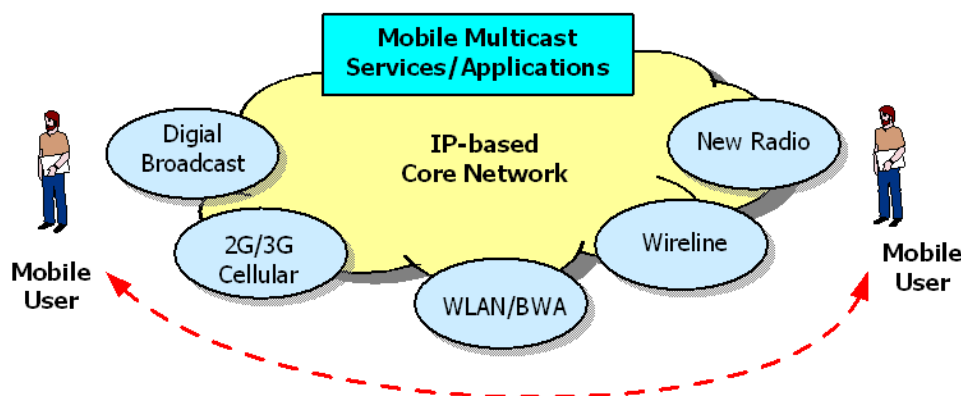


Figure 1 – Network environments in MMC

As shown in the figure above, the NGN environment is featured in the “IP-based core network” and a variety of “heterogeneous access networks.” In this scenario (figure 1), the network operator (or service provider) will provide various multimedia multicasting services/applications for users over the IP-based core network. Each (mobile) user will benefit from such comprehensive services through the various access networks. Each access network could be a