

# A IP Multicast Technique for the IP Broadcasting Service

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## Abstract

We described in this paper about a current situation of standardization of the multicast which is currently in progress, the next generation IP multicast evolution and the consideration subject of BcN control plan. In standardization progress situation various offers are in side of actual apply and the scalability out yet. Next a generation multicast alternative technique for a fusion service is Xcast, Overlay Multicast and SSM techniques. The service to use from now on the multicast is related with the alternative technique and will be provided.

Also, the offer will be from now on with hot discussion about a multicast control technique in BcN control plan. And a standardization task must be run paralleled.

## 1. Introduction

We are constructing a BcN(Broadband Convergence Network) which a convergence service supply which is fused into the one the communication and broadcasting is possible.

Therefore, The BcN needs a control technique like IPTV of a convergence service.

IP Multicast has been recognized as one of next a generation Internet key point techniques.

There was the matter of concern and interest of all the making company the research developer of learned circles and service vendor of enterprise of the industrial world.

'IP Multicast' was the kind of the treasure island to new field.[1]

Especially, IPTV service is becoming recently the topic of conversation as appear IP Multicast technique.

IPTV(Internet Protocol Television) service can be defined we want to support convergence service including VoD, broadcasting and communication service for next generation. It is provided through IP based broadband network and TV.

Many vendors of enterprises are offering currently a non-standard IPTV service. This has the limit with the interoperability at large scale universality service. Consequently, we are propelling the standardization about IPTV service technique at an international standardization instrument(ITU-T, ATIS, etc..) and TTA.

We try to watch in this paper about the current situation and evolution of IP multicast technique becoming the flower of IPTV service technique.

The remainder of this paper is organized as follows: In Section 2, we look into about a standardization of current situation of IP multicast which is processed in an international standard instrument the while[2,3,4,5]. In Section 3, we describe an evolution course of a multicast technique. And especially, we study about Xcast(Explicit

Multicast)[6], Overlay Multicast and SSM(Source Specific Multicast) technique which is taking the attention recently. In Section 4, we present a control technique multicast and issues of a hereafter BcN plan. Finally, we make the conclusion with a hereafter view in Section 5.

## 2. IP Multicast Standardization Current Situation

We look into the activity situation of MBONED, MAGMA, PIM as a working group about the multicast of IETF.

### 2.1 MBONED Working Group

Progress contents of MBONED working group's are as follows currently.

- An appoint method with the assignment of a multicast address.
- The method that the multicast connects many areas to become by the tunnel each other through the unicast.
- The reason to use ASM instead of SSM first at the multicast among domains in IPv6 environment.
- The method we apply DHCPv6 protocol and to specify a multicast address in IPv6 environment.
- The method which distributes the multicast prefix in IPv6 environment through the router advertisement to use the neighbor discovery.
- The case to be using SSM, how we can know a present time's index of the source easily in dynamic session which users go in and out easily.
- A technique clearing with IP a multicast routing protocol which has been used currently.
- In case of service of multi session through the multicast at the same time, how the issue to treat to control the receiver.

## 2.2 MAGMA Working Group

The MAGMA working group became in progress of the standardization around MGMD (Multicast Group Membership Discovery) and MIB to use at the management of multicast router discovery(draft-ietf-magma-mrdisc), IGMP and MLD.

It became 62 meetings ended the conclusion.

## 2.3 PIM Working Group

The task in Experimental situation which makes documents as proposed standard is under the progress in PIM working group. The contents to which are in process currently chiefly are as follows.

- It was the low so that we added the support about an administratively scope and supported Bidir-PIM at the same time with PIM-SM.
- New version for PIM of MIB to contain to be modified is published to IPv6.
- It makes PIM join possible through BGP-free core network.
- A last hop of a multicast tree has various vulnerabilities. Such vulnerabilities, the attack at this to base and the back of a confrontation plan about it.

## 3. IP Multicast Technique

### 3.1 Multicast IP Address

The multicast uses a class among IP address class D(224.0.0.0 ~ 239.255.255.255). Therefore, this IP data gram which the address begins with the "1110" is a multicast data gram. A remainder 28 bits is used even though it distinguishes a multicast group of the data gram which transmits a message.

We must set to receive the packet to specific group as if to set to Frequency of the radio.

### 3.2 IGMP(Internet Group Management protocol)

We use IGMP and grasp the existence of a group member which exists at an each network in the multicast. We grasp the reception yes or no of a multicast packet by have such information also. IGMP was composed of a query and report message.

A message format of IGMP is as follows. We attach IGMP message of the 8 bytes in IP header and send it. IGMP began from the v.1 and developed to the v.3. A Fig. 1 is expressing IGMP v.3 query message format.

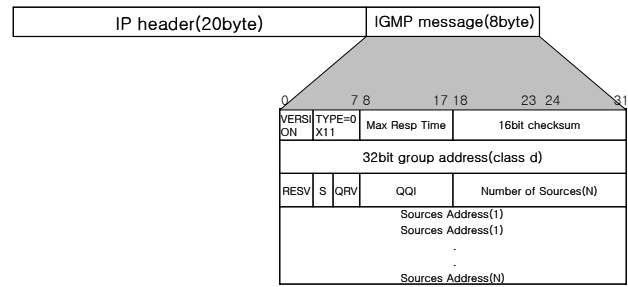


Fig. 1 IGMP v.3 query message format

Most big feature of IGMP v3 is a source filtering function. That is, we can determine the processing of the packet which the specific source.

## 3.3 Next generation IP a multicast routing technique.

A multicast technique has been evolved continuously. Especially, we look into about Xcast(Explicit Multicast)[9,10], Overlay Multicast and SSM(Source Specific Multicast)[8] technique which is taking the attention recently. These are related with the technique and IPTV service is viewed by developing.

### 1) SSM(Source-Specific Multicast)

SSM is prescribing the processing method about the data gram to be sent to SSM group address. A main feature, a multicast channel is discriminated with G giving to the combination of the sender of IP address S. A multicast channel is discriminated with group address G to the combination of the sender of IP address S. We can send data gram to SSM address we being therefore any host. SSM uses also Class D(232.0.0.0 – 232.255.255.255) address range.

SSM expresses the (S,G) channel. SSM deliver and to the host to be sent to want this about the data gram to the by (S,G). And SSM forwarding entry is managed and keep up so that it is different each (S,G). It is composed of a multiple outgoing interface list with one incoming interface.

SSM can become utility with existing multicast routing protocol. Especially It can be provided in PIM-SM, CBT easily through some expansion.

### 2) Xcast(Explicit Multicast)

Xcast is the new multicast technique to be made for the "Fate Sharing". It solves the problem to give the node of the network excessive load. It do efficient routing without the problem comes into being at the relay node or link.

Xcast(Explicit Multicast) is packet transmission technique based unicast of new concept's for multicast service support in small group. Xcast has a header structure like a Fig. 2.

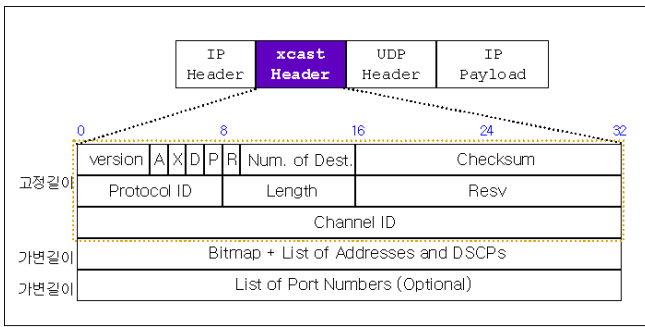


Fig. 2 Xcast Header Structure

Xcast stores a destination address of multicast channel which itself tries to spend the packet in the source. The source delivers the packet to the foundation a destination address of the header of xcast at a next neighborhood router.

And, if a destination address comes out, Xcast packet converts to a unicast packet. It delivers a unicast packet to a remainder route.

A Fig. 3 expresses a basic action concept of Xcast.

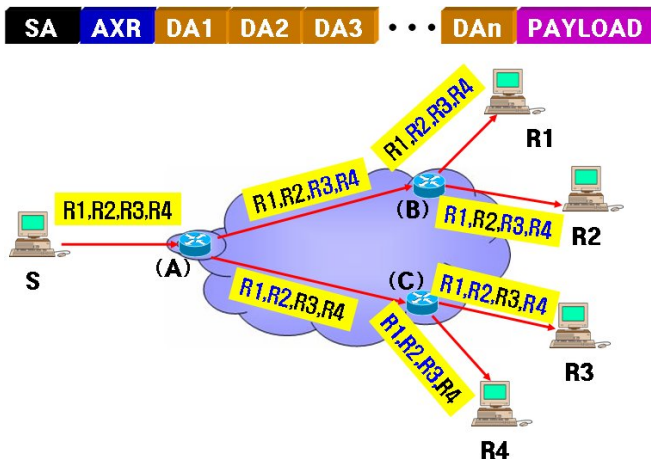


Fig.3 Xcast Concept

Xcast does not use a multicast group address in Xcast with the Fig. 1. It includes a unicast address of the group member one by one at a destination address of IP packet header. It is accomplish the routing in a medium router by an individual case destination address. And, if a destination address is ultimately one, it sends to that group member by the unicast.

Xcast can minimize a bandwidth waste of the link. And a route reset is possible to a unicast in case of a change of network topology.

On the other hand, it support restricted receiver because it has the transmission object address all at Xcast Header. More complex header processing is desired in applicable router because of searching of routing table about a packet each destination.

### 3) Overlay Multicast

The Overlay Multicast technique which to deliver IP multicast traffic to the subscriber without the aid of

Network Layer the introduction of IP multicast and a market formation appeared to means to overcome this because it came to be late.

Overlay Multicast technique is the concept of Client Relay and belong to the criteria of Application Level Multicast.

A Fig. 4 expresses basic action principle of Overlay Multicast.

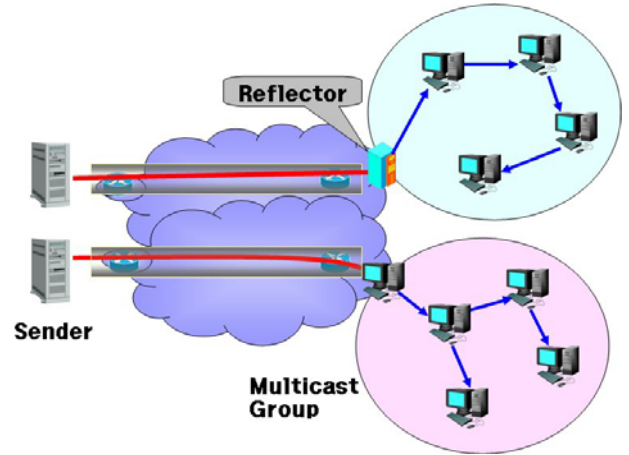


Fig. 4 Overlay Multicast Concept

Overlay Multicast accepts existing IP multicast model. The multicast application service provider has big concern in it. The reproduction of the packet and the relay is achieved it in the host. Therefore, it decreases the subordinate of the network and makes the efficiency of the resource.

On the other hand, it is suitable to one way service. It has the problem of a signaling processing and delay of packet transmission according to a shortest path tree construction and failure recovery. The subscriber must receive asynchronous data. The quality of the packet depends on a parent node

### 4. Considerations of Multicast in BcN

IPTV service becomes the flower of BcN is the service we use a rough copy net and to offer the information, image contents and broadcasting to TV.

The terminal is composed of IP STB and TV for IPTV service. And the unicast or multicast the network will be applied. Apply of Multicast needs surely if it considers the traffic of the network or efficient utility of resource.

Also, a service control functions for IPTV service must be integrated to a network control function. It must deal with the functions of subscriber/session/community management and AAA, configuration management.

Also, we must be equipped with IPTV service Infra which the functions of efficient multicast, customized session based on-demand QoS is supported to be standardized.

#### 4.1 A main issue for next a generation IP multicast

- ❖ Group Management (per Services)
  - A member multicast group construction and interworking between customer of other enterprise of that area.
  - The leave and the join of a multicast group by the movement of the subscriber.
  - The management of the group who a join and leave of a group member is frequent.
  - The management of a mobility multicast group.
- ❖ Session Management (per Session)
  - A multicast session hold about the member to move.
  - A session interworking of the unicast and multicast in the same service.
  - A multicast contents security.
  - Per subscriber billing which receives a multicast service.
  - A multiple multicast session control.
  - A nested multicast session control.
  - The synchronization of a multiple multicast transmission.
- ❖ Network Environment for Multicast Data Transport
  - The multicast which there is multicast group reliability(QoS).
  - The selection of Dynamic RP(Rendezvous Point) which considers the bi-directional.
  - IP Multicast, Overlay Multicast, IGMP snooping

#### 4.2 The Multicast Control Techniques in BcN Control Plan

We tried to arrange the main multicast control techniques to be considered in BcN control plan.

- A multicast session interworking technique between service providers.
- A multicast group management technique about a roaming subscriber.
- Hybrid(unicast + multicast) a multicast session control technique.
- A multiple(nested) a multicast session control technique.
- A dynamic RP(Rendezvous Point ) selection technique.
- A management technique of a portability multicast group.
- Contents based Premium a multicast session control technique.
- Contents a conversion session control technique which considers a terminal characteristic.
- A multikaeseuteu traffic goageum control technique.
- A join and leave of a multicast member a authentication control technique.

We described in this paper about a standardization current situation of the multicast which is currently in the progress, the next generation IP multicast evolution and the consideration subject of BcN control plan.

The standardization progress situation is being proposed variously for the application and scalability yet.

IP multicast technique have been evolved continuously. The hereafter, these are related with the technique and the service to use the multicast will be provided.

Also, the offer will be from now on with hot discussion about a multicast control technique in BcN control plan. And a standardization task must be run paralleled.

We must set up a multicast technique which can offer the IPTV service of the high quality as soon as possible.

#### Reference

- [1] Jee W. Lee, et al., "The consideration about IP a multicast market view," KICS Magazine, Vol. 19, 2002, pp.1577-1590.
- [2] Seok J. Koh, et al., "A trend of multicast technique for Internet Broadcasting," ETRI, The electronics and communication trend analysis, Vol. 17, 2002 June, pp.1-14.
- [3] Seok J. Koh, et al., "ECTP standard protocol for an multicast transmission between end-to-end," ETRI, Vol. 1016, 2001. 10.
- [4] Seok J. Koh, et al., "The new technology trend of internet multicast," ETRI The electronics and communication trend analysis, Vol. 16, 2001, 4, pp.1-9.
- [5] Enhanced Communications Transport Protocol(ECTP), <http://ectp.etri.re.kr>
- [6] ETRI, "Internet Broadcasting, A technique/market report, 2001.
- [7] Ralph Wirmann, "Multicast Communication Protocols and Applications", Morgan Kaufmann Publishers, 2001.
- [8] Seok J. Koh, "Internet multicast current situation and view, 2003.
- [9] Shin Myung Ki, et al., "The trend of Xcast technique, ETRI, The electronics and communication trend analysis, 2001.
- [10] Internet Draft, "Explicit Multicast (Xcast) Basic Specification", draft-oom-xcast-basic-spec-09.txt, December 2005.

#### 5. Conclusion