Multicast Routers Cooperating with Channel Announcement System

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Outline

• Introduction
  – Source-Specific Multicast (SSM)
• Problem statement and motivation
• Multicast channel validation mechanism
  – Proposed communication model consists of multicast routers and Channel Reflector
• Experiences
• Conclusion and future works
Source-Specific Multicast

• Traditional multicast communication (ASM)
  – Support many-to-many communication (e.g. meeting style applications) by PIM-SM/MSDP/MBGP for IPv4
  – Scalability problems
    • Third-party dependency
    • Traffic concentration
    • Flooding control messages (e.g. MSDP SA message)
  – Protocol complexities
    • Manage both Shared tree (RPT) and SPT

• Source-Specific Multicast (SSM)
  – One-to-many or few-to-many communication is feasible for inter-domain multicast services
  – Multicast data sender address can be specified
Source-Specific Multicast - cont.

Any-Source Multicast (ASM) with PIM-SM

Source-Specific Multicast (SSM)
Source-Specific Multicast - cont.

• Benefit
  – Source address discovery procedure is eliminated from multicast routing protocols
  – Core router (RP) and MSDP can be eliminated from multicast routing protocols
  – As the result, routing scalability problems and protocol complexities are fairly eliminated

There is no multicast deployment barrier anymore?
Useless Routing Path

• There is no source address discovery function in a multicast routing protocol for SSM
  – Multicast router does not recognize invalid or unavailable (S,G) joins
SSM Inconsistency

- SSM requirement: IGMPv3/MLDv2 host-side implementations
- Non-SSM capable node cannot trigger any join whose multicast address range is in an SSM range
  - But the node can receive the multicast data…

![Diagram showing the behavior of SSM and Non-SSM receivers with multicast joins.](image-url)
Motivation

• Objectives:
  – Source address validation mechanism in SSM communication
  – Mechanism for ASM node to adapt to an SSM network infrastructure

• Notes:
  – Solutions for both issues should be easily implemented to all senders, receivers and multicast routers
Multicast Communication Model

- **ASM communication**
  - Communication from a sender to a router
  - Communication from a sender to a receiver
Multicast Communication Model - cont.

- SSM communication
  - There is no communication between a sender and a router
Proposed Communication Model

- New multicast communication
  - New session announcement system, Channel Reflector, binds router, sender and receiver
  - Router and receiver can consult channel information (available (S,G) addresses, scheduled time)
Channel Reflector

• Original work
  – Main goal
    • Multicast session announcement without SAP
    • Web-based session directory system
    • Hierarchal policy and scope management system

• Activity in the IETF
Assumption and condition
- One “primary CR” exists in the Internet.
- Each controlled domain has one or more “site CR(s)”.
- Each site CR has a “parent-and-child” relation rooted from the primary CR.
- The parent-and-child relation is configured statically (like primary and secondary DNS configuration).
- The controlled domain forms the scoping area labeled with the site CR’s FQDN (e.g. cr.example.com).
- A client accesses an appropriate site CR which has been assigned by his administrator a priori (like DNS) as it is a regular Web server.
- Each site CR has own “Scope List” which consists of available scope label.
Channel Reflector - cont.

- Specification and behavior
  - (S,G) channel information is registered on each site CR by the site administrator or the authorized date sender (called the “registrant”).
  - A registrant specifies one associated scope label when he registers the channel.
  - Each channel information is described with Session Description Protocol (SDP) (RFC2327) or SDPng (I-D).
  - Registered channel information is distributed by hop-by-hop manner toward the scope boundary (= scope label), and it is registered on CRs inside the scope boundary.
  - By additional policy definition, channel information can be filtered.
Channel Validation Mechanism

• Channel Reflector
  – Can announce a well-managed session information consisting of available/valid multicast sender and group addresses to any nodes (including multicast routers)

• Multicast routers
  – Access to defined site CR {whenever they receive (*,G)/(S,G) join | when defined cache is expired}
  – Validate source and group addresses by stored channel information
  – Can translate (*,G) join to (S,G) join(s) if defined
Channel Validation Mechanism - cont.
Channel Validation Mechanism - cont.

• Summary
  – Multicast routers can verify each multicast join by accessing their Channel Reflector
  – Multicast routers translate (*,G) join to (S,G) join(s) when they access their Channel Reflector

• Additional benefit
  – Policy and scope definitions can be inherited to multicast routers
    (Multicast address would not be used for scope definition)
Experiences

XML data set

channelerd

XML Parser

pimd

SOAP Call

/HTTP

SOAP Response

/HTTP

PIM (S,G) Join

IGMP (S,G) Join

register channel information

CGI

Registrant

R

<?xml version="1.0" encoding="UTF-8"?>
<document
xmlns:ns=http://channelreflector.net>
<ns:ChannelReflector>
<label>CR.example.com</label>
</ns:ChannelReflector>
<ns:ChannelInfo>
<scope>CR.example.com</scope>
</ns:ChannelInfo>
</document>
Conclusion and Future Works

• Summary
  – We propose a new communication model with Channel Reflector
  – Result
    • Multicast routers can verify each multicast join
      – Bogus/unavailable (S,G) joins can be completely ignored
    • Multicast routers translate (*,G) join to (S,G) join(s)
      – Non-SSM capable nodes can join SSM channel

• Future works
  – Scalability vs. preciseness
    • Access per join request? Cached channel information?
    • Access per each report? Only for an initial join?
  – ASM-to-SSM translation experience
    • Group-and-Source-Specific Query
Thank you.