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Multicast Routers Cooperating with Channel Announcement System

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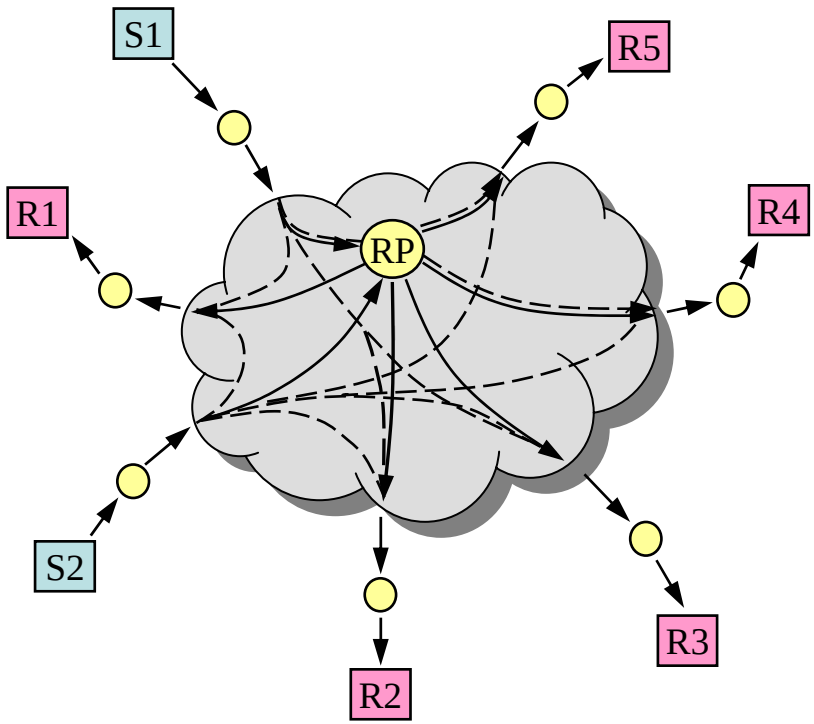
Outline

- 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

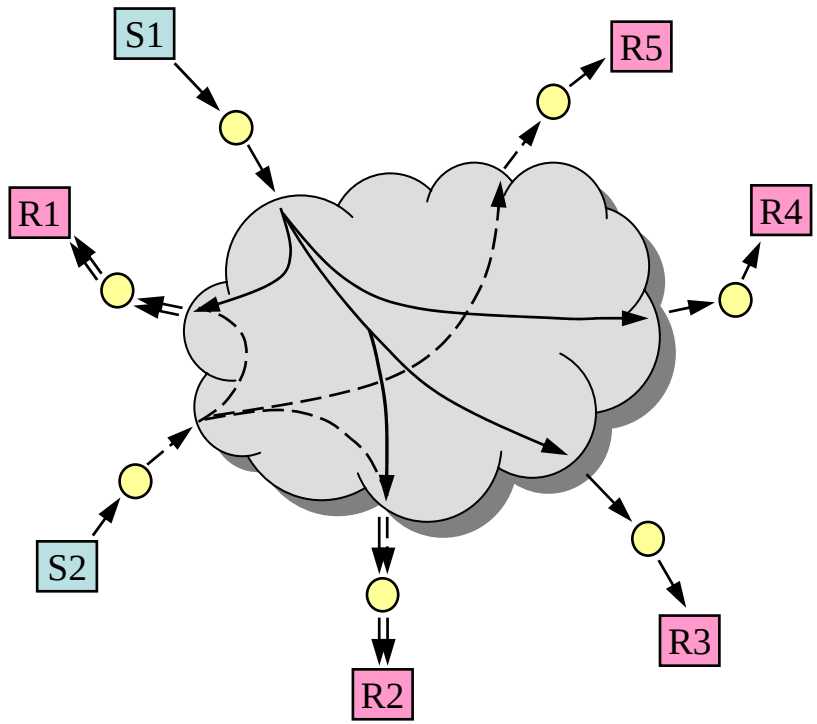
Source-Specific Multicast

- 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)

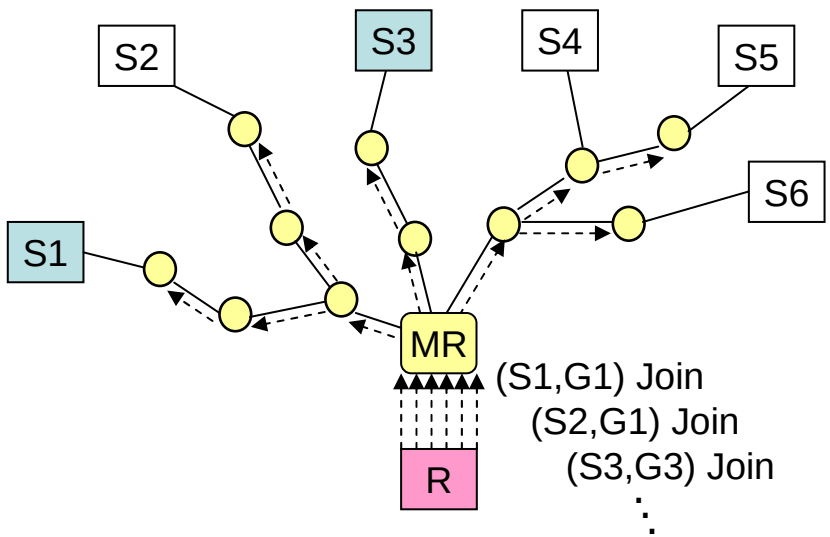
Source-Specific Multicast - cont.

- 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?

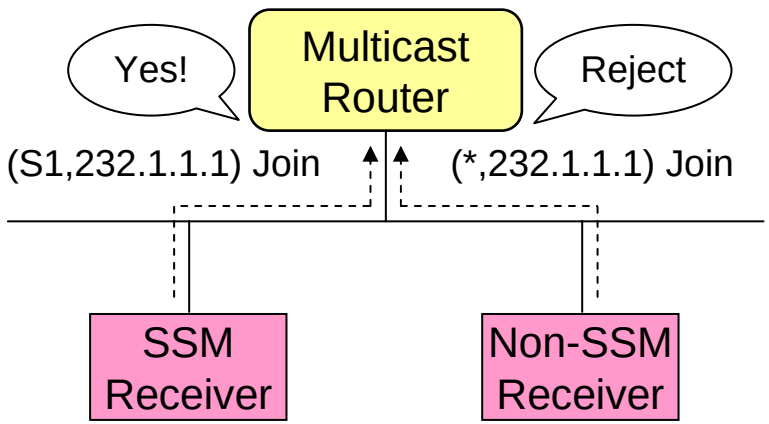
Useless Routing Path

- 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…

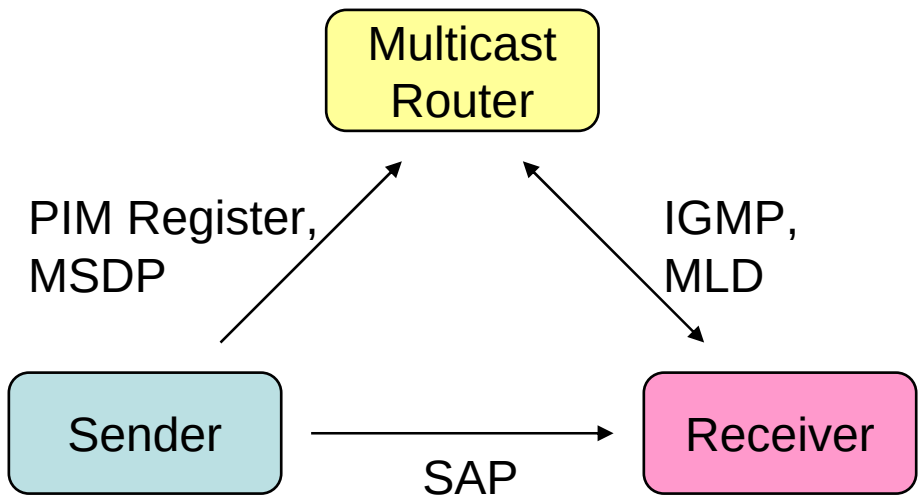


Motivation

- 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

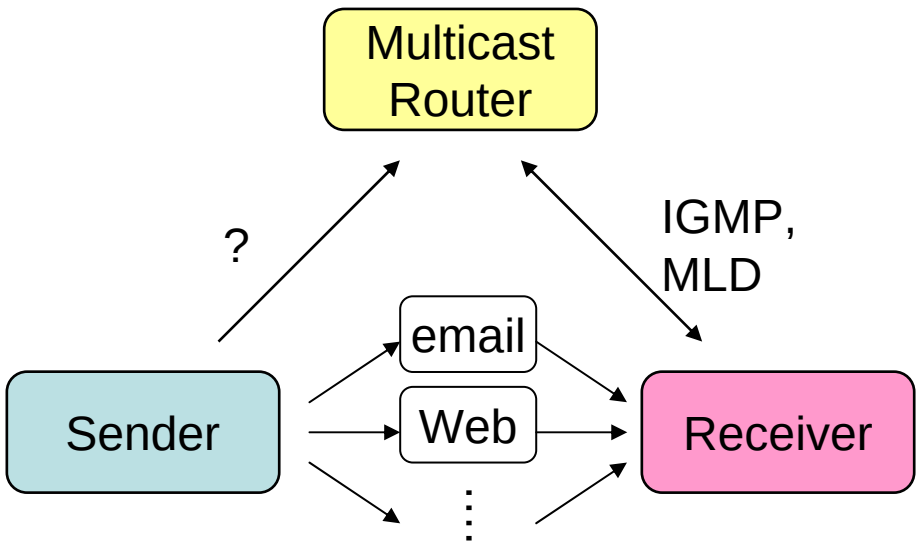
Multicast Communication Model

- ASM communication
  - Communication from a sender to a router
  - Communication from a sender to a receiver



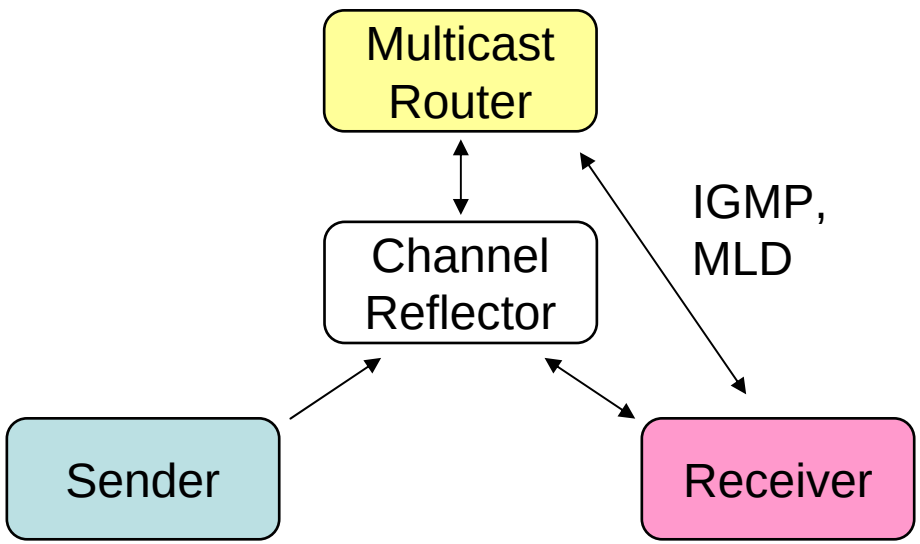
Multicast Communication Model - cont.

- SSM communication
  - There is no communication between a sender and a router



Proposed Communication Model

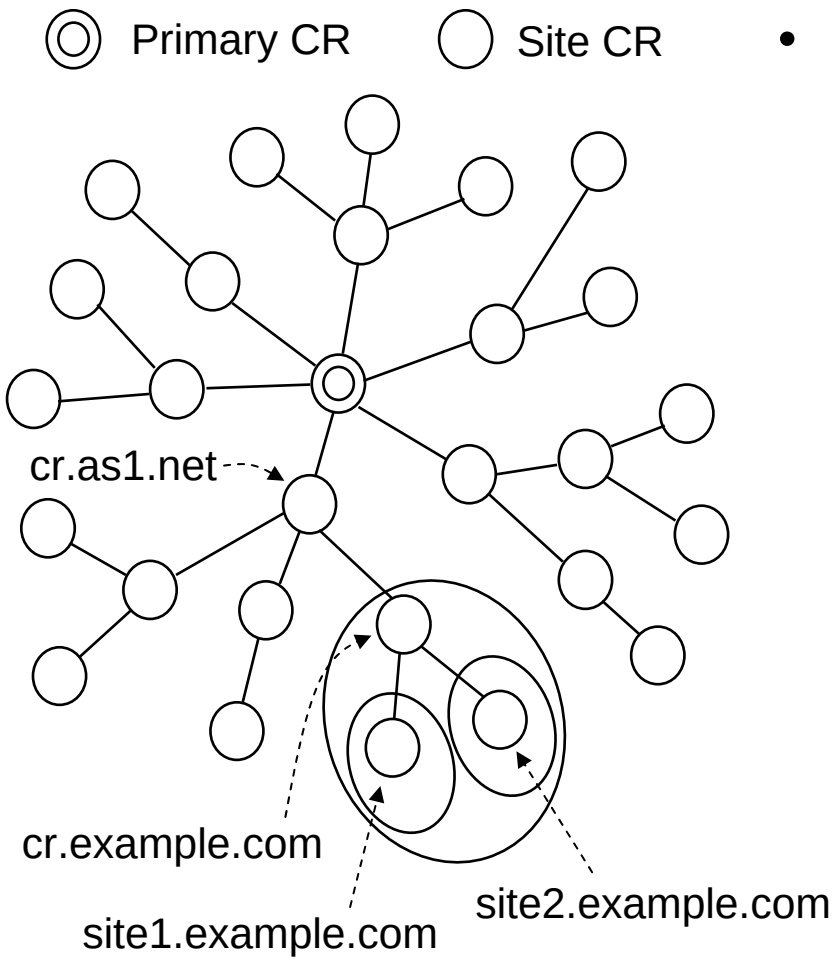
- New multicast communication
  - New session announcement system, Channel Reflector, binds router, sender and receiver
  - Router and receiver can consult channel information (available (S,G) addresses, scheduled time)



Channel Reflector

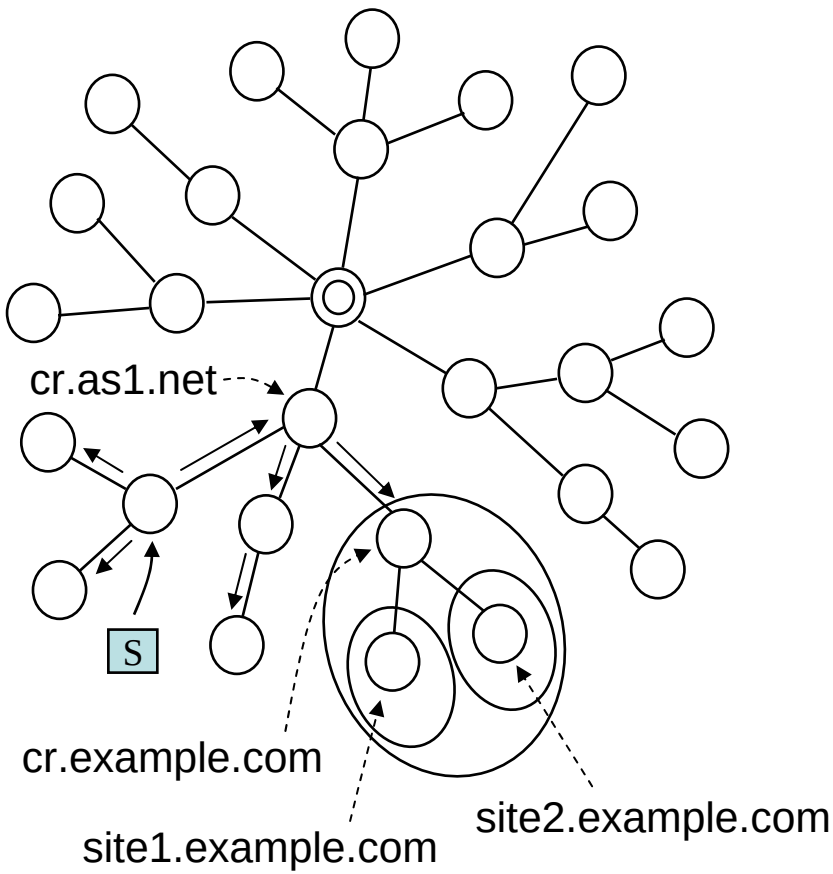
- Original work
  - Hitoshi Asaeda and Vincent Roca, “Consideration of Multicast Channel Announcement Architecture", INRIA Research Report, RR-4762, March 2003.
  - Main goal
    - Multicast session announcement without SAP
    - Web-based session directory system
    - Hierarchal policy and scope management system
- Activity in the IETF
  - Yuji Nomura, Rod Walsh, Juha-Pekka Luoma, Hitoshi Asaeda and Henning Schulzrinne, "A Framework for the Usage of Internet Media Guides", draft-ietf-mmusic-img-framework-02.txt, IETF MMUSIC WG, December 2003

Channel Reflector - cont.



- 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

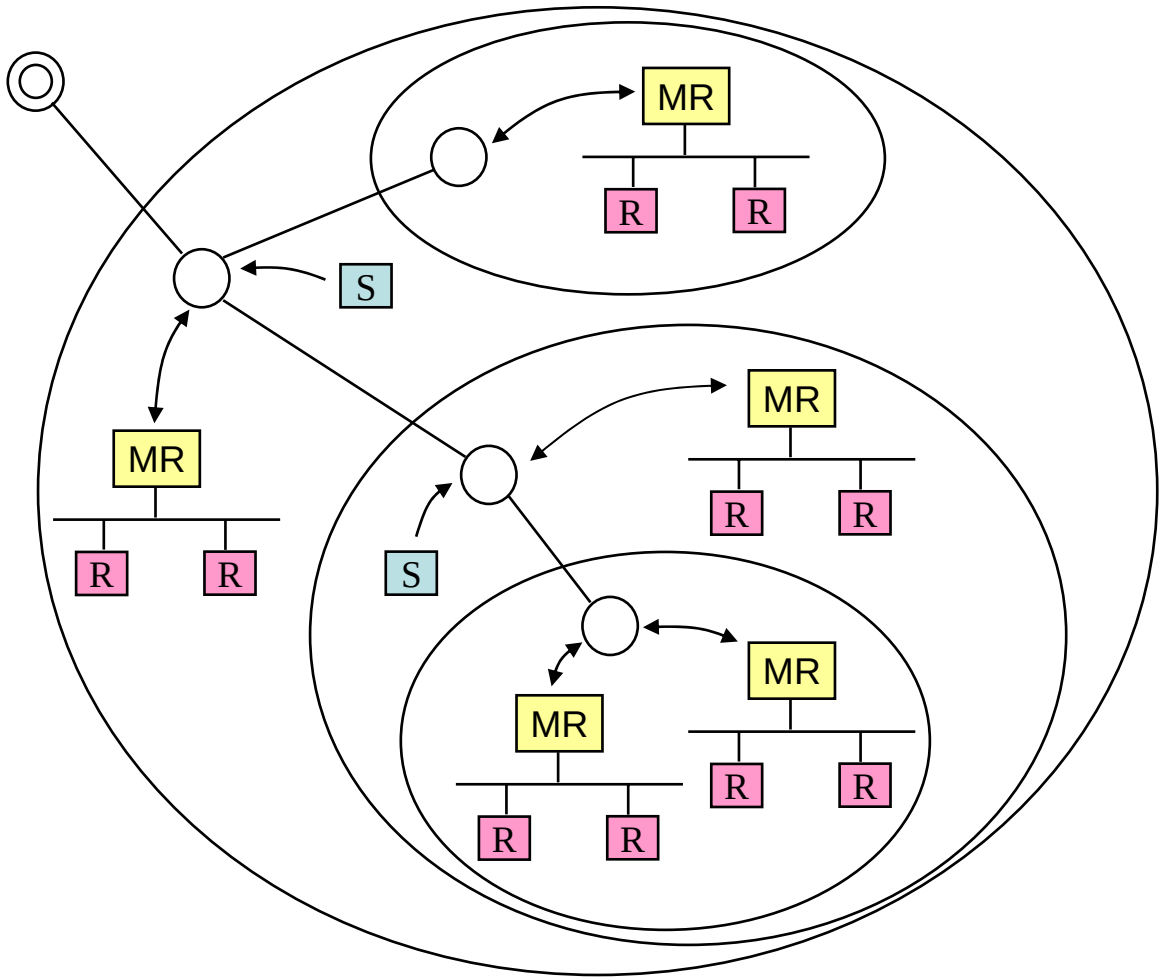
- Channel Reflector
  - Can announce a well-managed session information consisting of available/valid multicast sender and group addresses to any nodes (including multicast routers)

- Multicast routers
  - Access to defined site CR

    {whenever they receives (*,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.

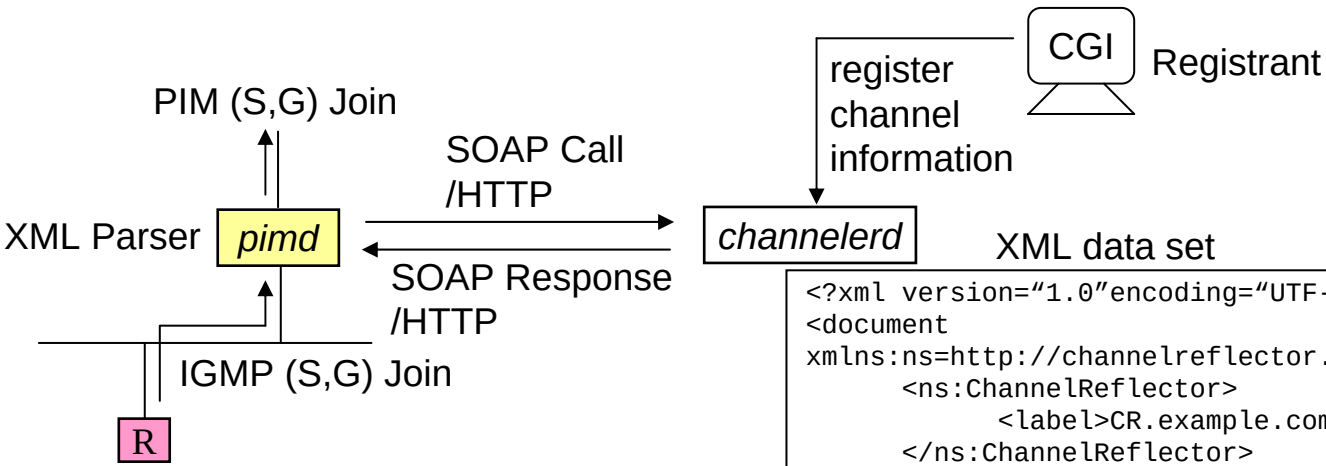


Channel Validation Mechanism - cont.

- 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

```
<?xml version="1.0"encoding="UTF-8"?>
<document
xmlns:ns=http://channelreflector.net>
      <ns:ChannelReflector>
            <label>CR.example.com</label>
      </ns:ChannelReflector>
                  ⋮
      <ns:ChannelInfo>
            <group>232.0.1.2</group>
            <source>
               <addr>test.example.com</addr>
               <port>54321</port>
               <scope>CR.example.com</scope>
               <type>test</type>
            </source>
                  ⋮
      </ns:ChannelInfo>
      <ns:ChannelInfo>
                  ⋮
      </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.