Alternative Solutions toward IPv4/IPv6 Multicast

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Agenda

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II. Alternative Multicast Technologies: CastGate

III. Proposed Improvements
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   II. Sending Multicast
   III. IPv6 CastGate

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I. Introduction
Introduction

- Point-to-multipoint communication
- Multimedia content streaming – **MULTICAST**
- Lack of multicast deployment:
  - technical reasons (high complexity)
  - marketing reasons (no customers)
- Group management – IGMP Internet Group Management Protocol
- Native multicast creates distribution trees:
  - PIM (Protocol Independent Multicast)
  - DVMRP, MOSPF, CBT
- **AGCS – Alternative Group Communication Service**
II. CastGate

- CastGate Client
- CastGate Router
CastGate

- CastGate:
  - transition technology
  - seamless access to multicast
  - based on Enhanced UMTP (UDP Multicast Tunneling Protocol)

- CastGate architecture:
  - CastGate Tunnel Client
  - CastGate Tunnel Server
  - CastGate Tunnel Database Server

- CastGate Router
  - CastGate Client
  - IGMP Querier
CastGate Client

End Host

CastGate Tunnel Client

Unicast Internet

UMTP Tunnel

CastGate Tunnel Client

End Host

Multicast Internet

Tunnel Server

Tunnel Database Server

End Host

CastGate Tunnel Client

UMTP Tunnel

End Host

CastGate Tunnel Client

UMTP Tunnel
CastGate Router
III. Proposed Improvements

CastGate Router with PIM-SM
Proposed Improvements

- Provide multicast access – **entire local domain**
- Local domain = group of networks with multicast capabilities (multicast routing protocol), no global multicast access
- PIM-SM (Sparse Mode)
  - shared root RP (Rendezvous Point)
- RP-on-a-stick a single PIM-SM interface
  - incoming interface of (S, G) entry
  - outgoing interface on the shared tree for group G
- CastGate Router + partial PIM-SM functionality
CastGate with PIM-SM
Receiving multicast

- **PIM-SM module:**
  - capture messages destined to RP
  - Join/Prune (*, G) messages
  - “join” group G through the tunnel
  - modified version of downstream per-interface (*, G) state machine from PIM-SM protocol specification

- **Machine states:**
  - NoInfo (NI)
  - Join (J)
  - Prune-Pending (PP)
Receiving multicast

- Send Prune-Echo (*, G)
- Terminate tunnel
- Prune-Pending Timer Expires
- Expiry Timer Expires
- Join (*, G)
- Prune (*, G)
- Start Expiry Timer
- Create tunnel
- Start Prune-Pending Timer
- Prune (*, G)
- Join (*, G)
- Restart Expiry Timer
Sending multicast

PIM-SM module:
- capture PIM Register messages, (S, G) information
- discard Null-Register messages
- send Hello messages !! DR election !!
- send Join (*, G) messages
- state machine for forwarding multicast traffic through tunnel

Machine states:
- NoInfo (NI)
- Join (J)
Sending multicast

Diagram:

- NI
  - receive PIM-SM Register (S, G)
  - Keepalive Timer Expires
  - send Prune (*, G)

- J
  - receive multicast data for G
  - send Join (*, G)
  - start Join Timer
  - start Keepalive Timer
  - restart Keepalive Timer
IPv6 CastGate

- CastGate used for transition to IPv6
- Scenarios:
  - IPv6 multicast tunneled over IPv4 CastGate
  - IPv6 multicast tunneled over IPv6 CastGate
- CastGate architecture modifications:
  - IPv6 Enhanced UMTP
    - 12-octet trailer replaced by 24-octet trailer
    - 16-octet trailer replaced by 40-octet trailer
  - IPv6 capable Tunnel Client
  - IPv6 capable Tunnel Server
  - no modification needed for Tunnel Database Server
IV. Conclusion
Conclusion

- **AGCS – CastGate:**
  - existing solution: CastGate Client, CastGate Router
  - enhancement: CastGate Router with PIM-SM
- IPv6 CastGate for transition to native IPv6 multicast
- Final solution is multicast
- Further work:
  - possible generalization to other AGCS technologies
  - performance evaluation
  - suitable metrics for AGCS technologies and native multicast
Thank you!