An on Demand IPv4/IPv6 Multicast Translator

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1. INTRODUCTION

INTRODUCTION

- Context transition to IPv6
  - IPv4/IPv6 nodes
  - only IPv4 nodes
  - only IPv6 nodes
- Mechanism for direct communication between IPv4 and IPv6 nodes
- Unicast - dual-stack servers
- Multicast – source streams to both IPv4 and IPv6 group
- Translation device on the path between the source and destination

2. EXISTING PROPOSALS

EXISTING PROPOSALS

- Transport Relay Translator (TRT)
  - *"An IPv6-to-IPv4 Transport Relay Translator"* RFC 3142 2001
  - only TCP => unicast
- Stateless IP/ICMP Translation Algorithm (SIIT)
  - RFC 2765 E. Nordmark 2000
  - IPv4 embedded IPv6 address 0::ffff:0:a.b.c.d => unicast
- Multicast translation mechanisms:
  - Multicast Translator Proxying (MTP)
    - *"An IPv6/IPv4 Multicast Translator based on IGMP/MLD Proxying"* draft-ietf K. Tsuchiya 2002
  - UNINETT
    - *"An IPv4-IPv6 Multicast Gateway"* S. Venass 2003

MTP-MULTICAST TRANSLATOR PROXY

- Uses:
  - IGMP – Internet Group Management Protocol for IPv4
  - MLD – Multicast Listener Discovery for IPv6
  - "IPv4-compatible" IPv6 multicast group address ffxy::IPv4multicast_address/96
- Two translation modes:
  - gateway
  - header conversion router
- Disadvantages
  - configuration by the domain administrator
  - only small-scale networks

UNINETT

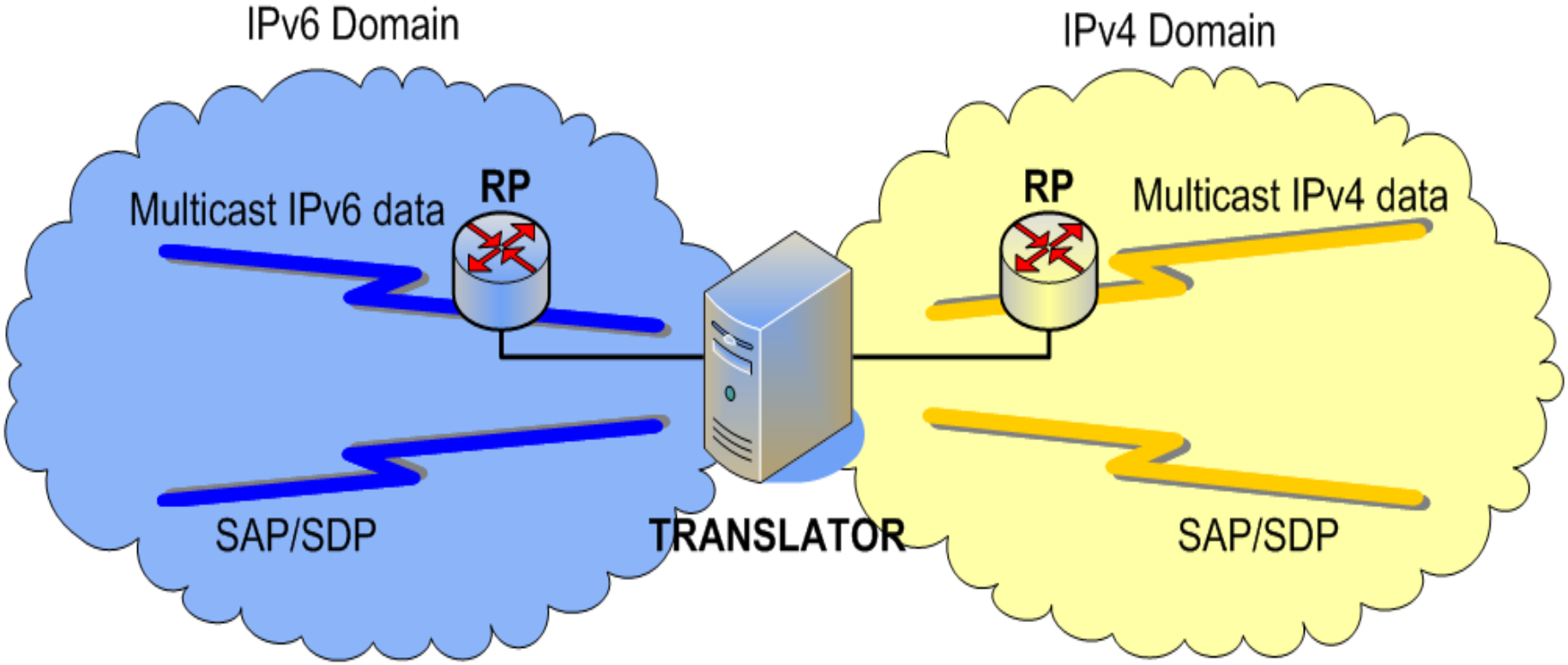
- Uses:
  - IGMP – Internet Group Management Protocol for IPv4
  - MLD – Multicast Listener Discovery for IPv6
  - "IPv4-compatible" IPv6 multicast group address ffxy::IPv4multicast_address/96
  - PIM-SM (Protocol Independent Multicast – Sparse Mode) for IPv6
- Translates SAP/SDP (Session Announcement Protocol / Session Description Protocol) messages
- Disadvantages:
  - IPv6 multicast is translated even if there are no IPv4 receivers for it

3. TRANSLATOR ARCHITECTURE

TRANSLATOR ARCHITECTURE

- Uses:
  - IGMP – Internet Group Management Protocol for IPv4
  - MLD – Multicast Listener Discovery for IPv6
  - PIM-SM for both IPv6 and IPv4 domains
- Multicast address:
  - "IPv4-compatible" IPv6 multicast group address
  - arbitrary mappings between IPv4-IPv6 group addresses
- SAP/SDP messages are also translated
- Translator location:
  - on the edge between IPv4/IPv6 domains
  - on the same link as the RP (Rendezvous Point)

TRANSLATOR ARCHITECTURE



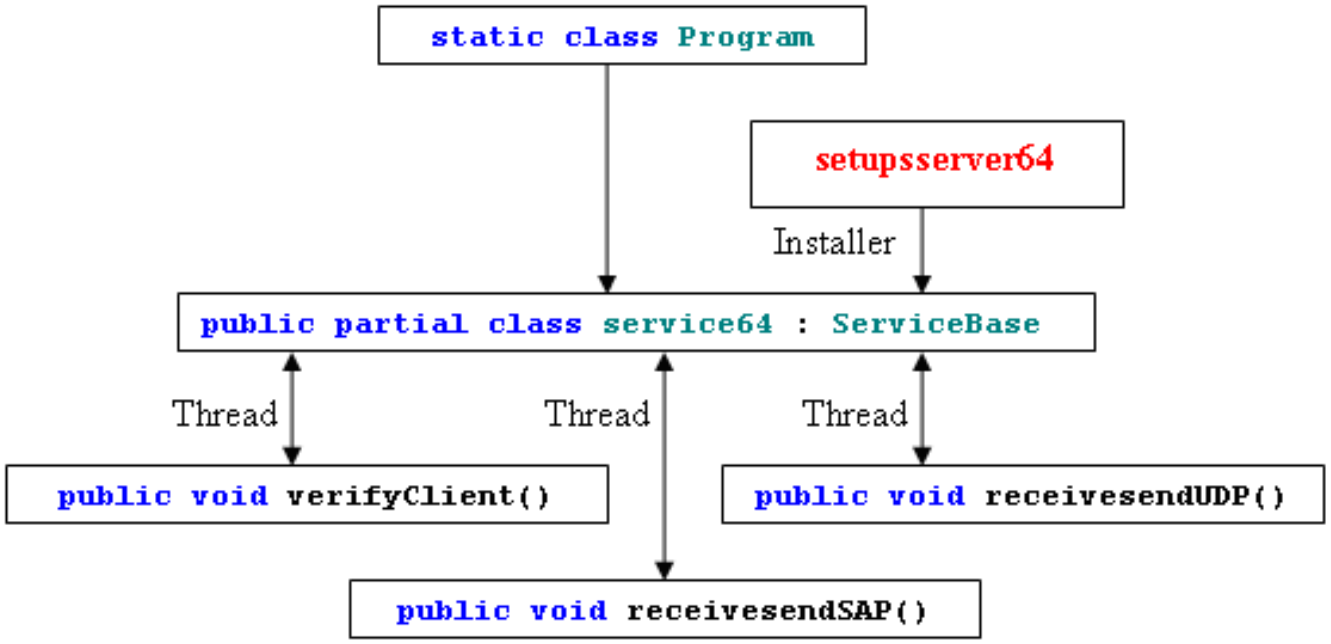
4. IMPLEMENTATION DETAILS

IMPLEMENTATION DETAILS

- Separate modules:
  - IPv4 to IPv6 translation
  - IPv6 to IPv4 translation
  - can be used independently
  - bidirectional translation requires the use of both modules
    - on the same node
    - on different nodes => fault tolerance
- Implementation under Windows OS using Microsoft Visual Studio 2005
- Windows service functionality

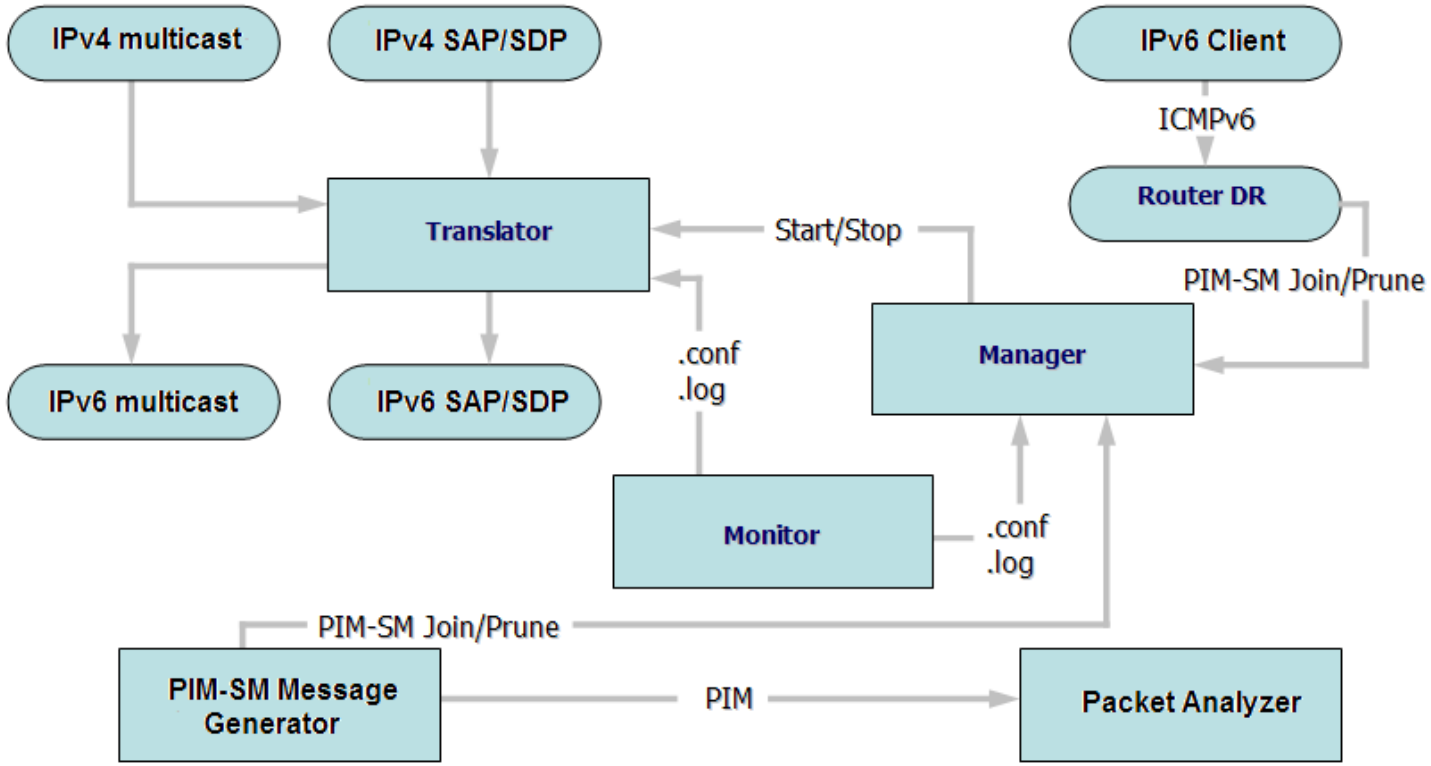
IMPLEMENTATION DETAILS

- IPv6 translator



IMPLEMENTATION DETAILS

- IPv4 translator



5. CONFIGURATION ISSUES

CONFIGURATION ISSUES

- Configuration file *fisierod.conf*

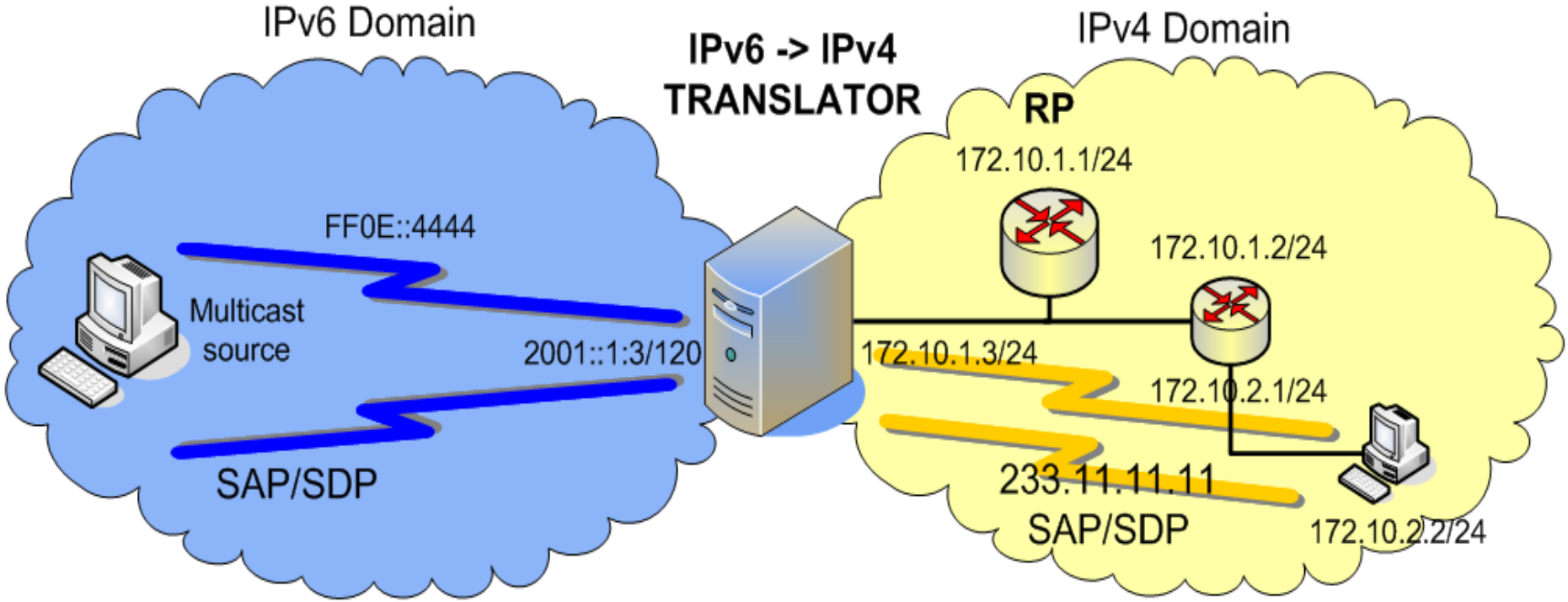
```
<Configuration file of the service. Do not change the order of
   the parameters>
IPv6 local address:            2001::1:3
IPv6 multicast address:        FF0E::4444
IPv4 local address:            172.10.1.3
IPv4 multicast address:        233.11.11.11
IPv6 Port:                     4444
IPv4 Port:                     5555
IPv6 SAP address:              FF0E::2:7FFE
IPv4 SAP address:              224.2.127.254
SAP Port:                      9875
PIM address:                   224.0.0.13
PIM Listener Port:             3333
```

6. TEST ARCHITECTURE

TEST ARCHITECTURE

- IPv6 to IPv4 translator testbed
  - two IPv4 PIM-SM routers with XORP (eXtensible Open Router Platform)
  - VLC Media Player to send multicast content
  - Wireshark 0.99.6 for traffic capture
- Correct translation checked by comparing original IPv6 packet with IPv4 packet for:
  - multicast data
  - SAP/SDP messages
- Similar testbed for IPv4 to IPv6 translation

TEST ARCHITECTURE



7. TRANSLATION DELAY

TRANSLATION DELAY

- Translation delay = the time elapsed from the moment a packet is received by the translator to the moment the packet is sent using a different IP version
- Average values:
  - IPv6 to IPv4
    - multicast data 0.598 ms
    - SAP/SDP messages 0.604 ms
  - IPv4 to IPv6
    - multicast data 0.987 ms
    - SAP/SDP messages 2.023 ms
- Difference between the two cases due to the use of two separate software modules

8. CONCLUSION

CONCLUSION

- New on demand translation mechanism
  - design
  - implementation
- Translation is started only on demand if IPv4/IPv6 receivers request it
- Windows implementation, previous proposal were implemented under Linux/FreeBSD
- Translation delay was determined
  - slight differences between the two software modules
  - values are negligible