

# The M6Bone: International Experiments with IPv6 Multicast

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# The M6Bone: International Experiments with IPv6 Multicast

- M6Bone
- 6NET and M6Bone
- Interdomain multicast
- Reflectors
- IPv4 - IPv6 multicast gateway
- Applications and content

# M6Bone

- An IPv6 Multicast test network
- Established in July 2001 by Aristote association, G6 and RENATER
- Today about 40 sites from four continents are connected

## Goals

- To offer IPv6 Multicast connectivity to interested sites
- Test software and hardware related to IPv6 multicast
- Through deployment and use, learn about IPv6 multicast issues
- Offer the necessary infrastructure for IPv6 multicast applications
- To be used for conferencing and seminar distribution

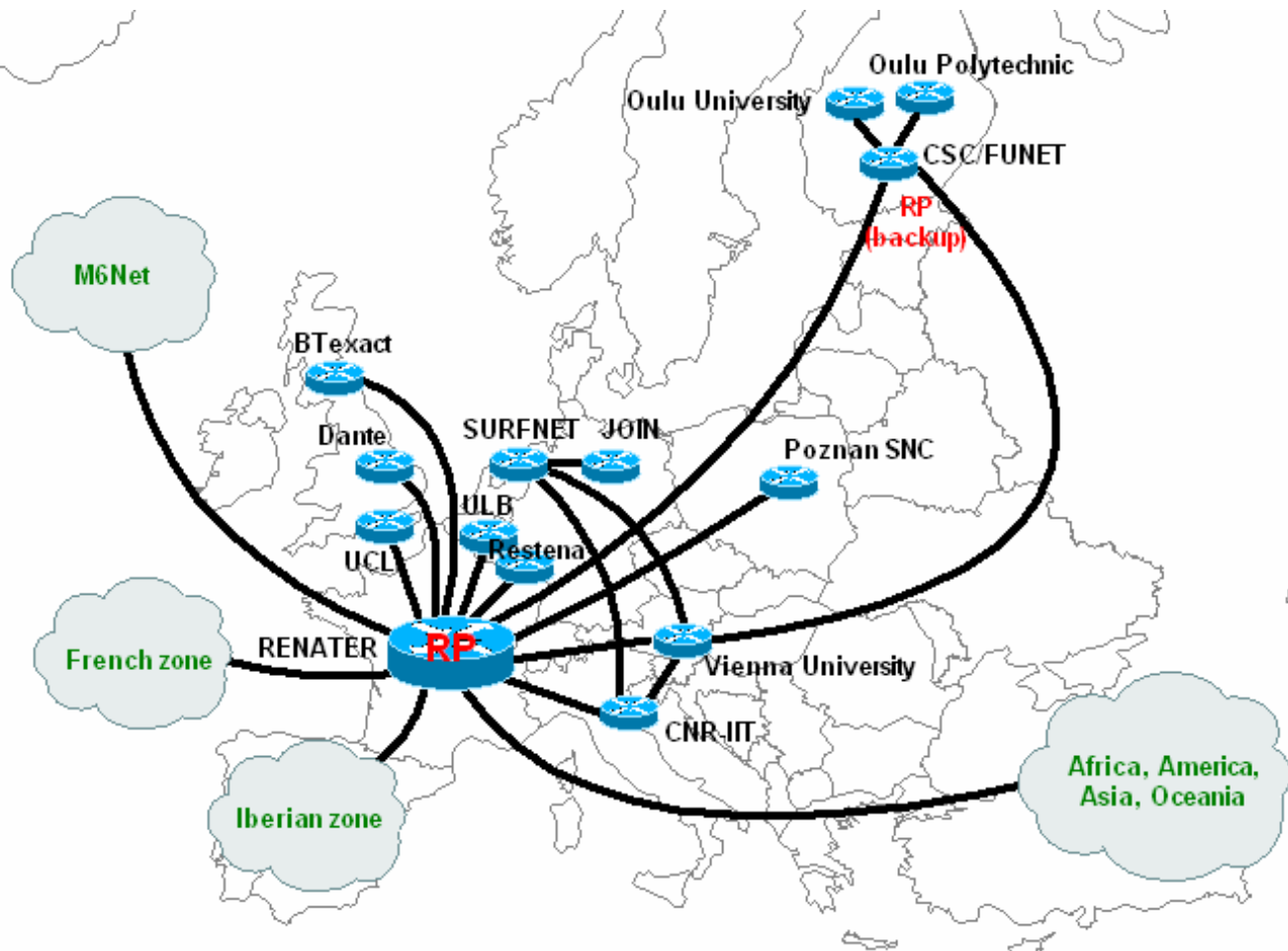
## Contact info

- Web site at <http://www.m6bone.net/>
- May also contact [m6bone-team@renater.fr](mailto:m6bone-team@renater.fr)
- Mailing list [m6bone@ml.renater.fr](mailto:m6bone@ml.renater.fr)
  - More than 130 active and experienced people

# M6Bone - World



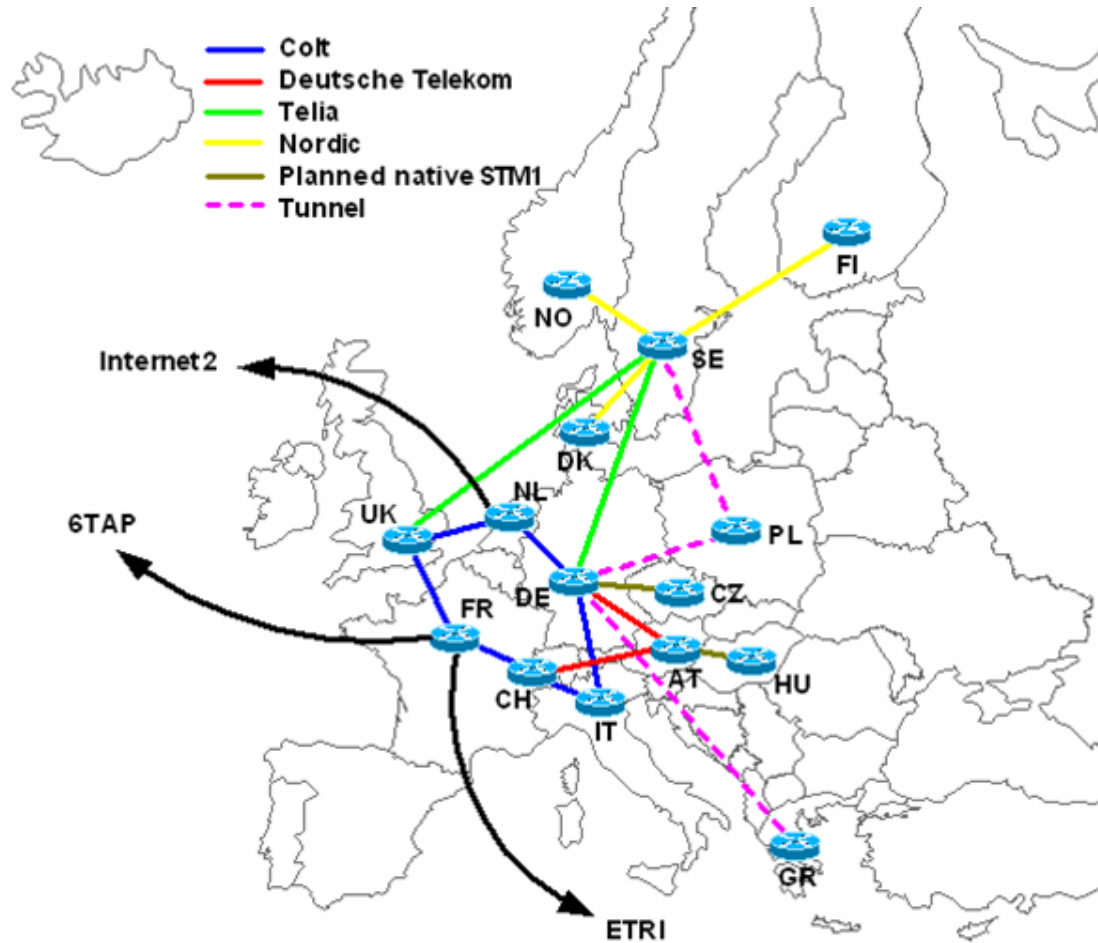
# M6Bone - Europe



# M6Bone - protocols and hardware

- PIM SM
- Multiple RPs, global RP operated by RENATER
- BSR for distributing RP config
- Routes exchanged with RIPng
- Tunneled network for multicast only
  
- Most routers used cannot separate unicast and multicast
  - Using unicast routing table for RPF checks
  - The solution is to use the routers for multicast only
  
- Routers: FreeBSD, BSD+KAME, Cisco, 6WIND, Hitachi
- Hosts: \*BSD, Linux, XP

# 6NET Network



# 6NET and M6Bone

- About 15 6NET partners have been directly connected to M6Bone
- Native multicast is now being deployed in 6NET
- 6NET partners will connect to M6Bone through 6NET
- 6NET connected to M6Bone through RENATER
  - 6NET is one zone of non-global scope
  - 6NET has one RP for the 6NET scope, not visible outside
- Using Cisco routers that support multicast routes
  - Unicast and multicast topologies can be divergent
- MBGP for exchanging multicast routes



# Interdomain multicast

- No MSDP or similar for learning about sources
- Hence everyone must use same RP for a given group
  - if they wish to communicate
- Hence 6NET uses same global RP as rest of M6Bone
- Doesn't scale to global usage
  
- No global IPv6 ASM service?
- No global SAP/SDR(?)
- SAP/SDR uses a specific group for announcements
- One single RP in the world for global SAP?
  
- SSM and embedded RP might be useful

# Source Specific Multicast (SSM)

- Might see only SSM used for global multicast
- SSM good for broadcasting etc with one single source
- Video conferencing etc with multiple sources can also be done
- Source discovery needs to be done at application level
  - Simple with one fixed source
  - Much more complex with many dynamic sources

# Embedded RP addresses

- draft-savola-mboned-mcast-rpaddr-xx.txt
- Unicast address of RP embedded into group address
- Makes global ASM scale
- Still one single RP per group
- SAP/SDR still difficult
- Session creator/owner/initiator chooses the RP when choosing group address

# Reflectors

- A reflector is something receiving a multicast stream and resending it as multiple unicast streams
- Might be two-way. Data sent by one of the unicast receivers are resent to all the others, and to multicast group
- Independent of whether group is IPv4 or IPv6, unicast streams might be a mix of IPv4 and IPv6
- For IPv4-IPv6 a reflector simultaneously joining an IPv4 group and an IPv6 group is useful.
  - This is useful even without unicast

# Reflectors tested in 6NET

- <http://www.kabassanov.com/reflectors/>
- Need to manually run a reflector for each group
- Reflectors are always joined to group when running
  - Could be changed to leave group when no receivers
  - Difficult when reflecting between two multicast groups
- Reflectors detect unicast participant by receiving packets
  - Two neighbouring ports monitored, so works fine with RTP/RTCP applications
  - Works in general if application sends before it receives
  - NTE uses only one port, but will send before receiving
  - Doesn't work at all with receive-only applications
  - Some reflectors solve this using out-of-band signaling through web or require extra client software
- Reflectors remove unicast participants when stop sending
  - Currently 5 minute timeout, should be much shorter
  - For RTCP it can be a few seconds

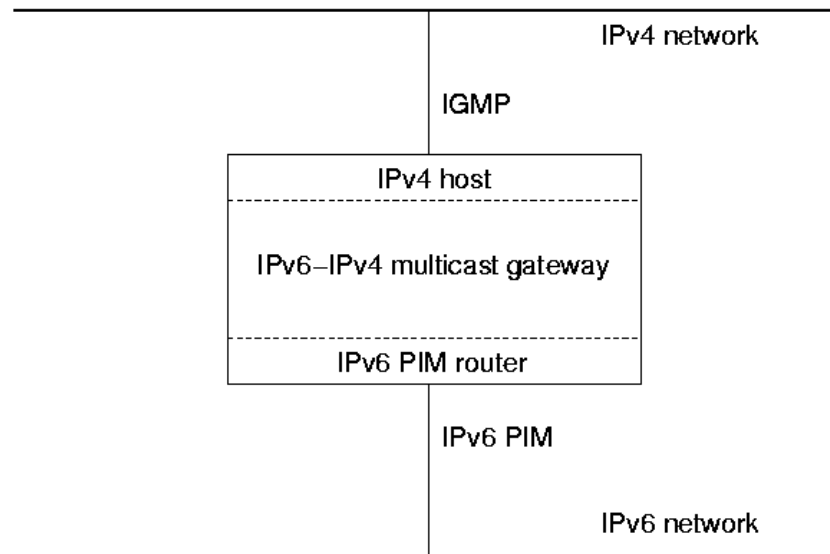
# IPv4 - IPv6 multicast gateway(1)

- draft-venaas-mboned-v4v6mcastgw-00.txt
- Translates between IPv4 and IPv6 multicast
- Might be placed at border between IPv4-only and IPv6-only networks
- Depends on PIM-SM. Can be deployed and used by an entire IPv6 PIM domain with no modifications to any other software
- IPv4 multicast space embedded into IPv6
- Uses a /96 IPv6-prefix. Last 32 bits are the IPv4 address
- IPv4 and IPv6 multicast trees joined at gateway
- Gateway is IPv4 leaf node
- Gateway is IPv6 RP for the /96 prefix

# IPv4 - IPv6 multicast gateway(2)

- An IPv6 host can receive data from an IPv4 group a.b.c.d by joining the IPv6 group PREFIX:a.b.c.d
- An IPv6 host can send data to an IPv4 group a.b.c.d by sending to the IPv6 group PREFIX:a.b.c.d
- An IPv6 host can send without joining
- Allows e.g. videoconferencing with IPv4 and IPv6 participants; where all can send to and/or receive from all others

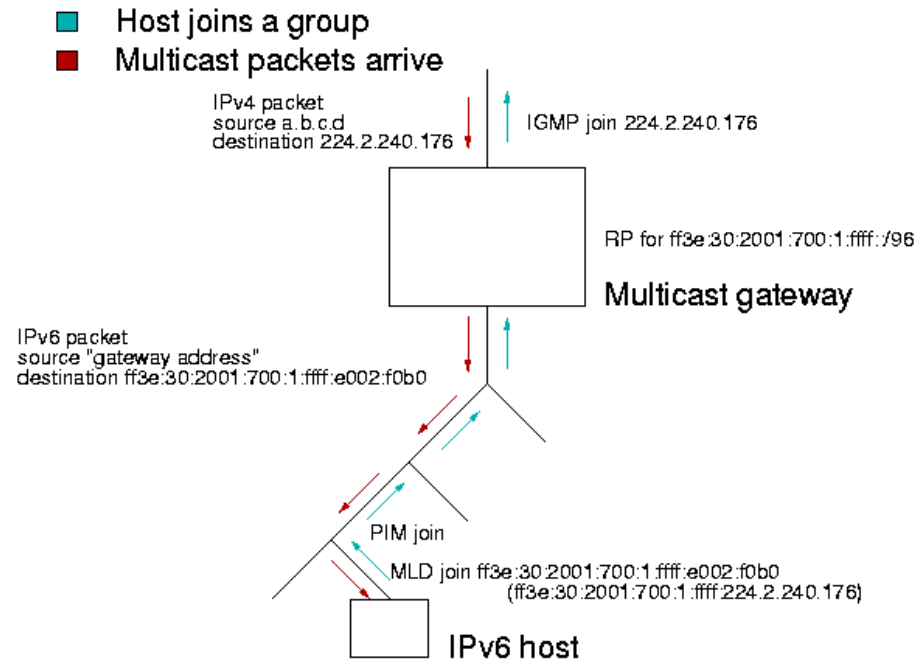
# IPv4 - IPv6 multicast gateway(3)



- In IPv4 the gateway is a multicast host using IGMP
- In IPv6 the gateway is a PIM router and RP for the /96 prefix

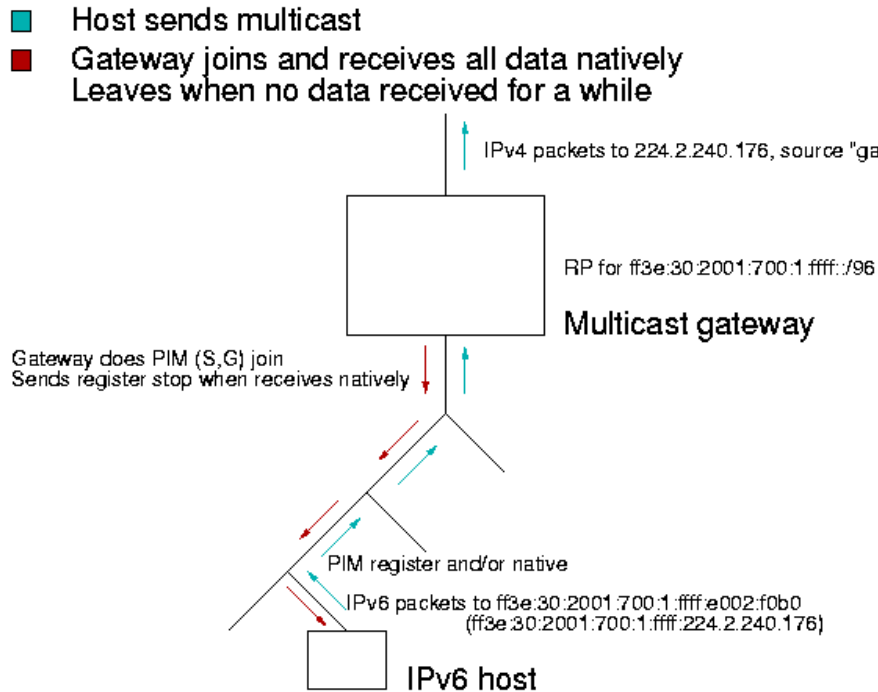


# IPv4 - IPv6 multicast gateway(4)



- All IPv6 joins in PIM domain reaches gateway
- Gateway joins corresponding IPv4 group
- Gateway resends all IPv4 multicast for joined IPv6 groups

# IPv4 - IPv6 multicast gateway(5)



- IPv6 host sends packets to a group
- Gateway may join the IPv6 group to receive data natively
- Gateway resends all IPv6 packets to the respective IPv4 groups

# Applications (1)

The screenshot displays a Windows desktop environment. The primary window is "6NET People", a video conference application. It features a grid of 16 participants, each with a small video window and a control panel. The control panels include a "mute" checkbox, a "color" checkbox, and an "info..." button. The participants listed are:

- Ahmed Shnoun (Renater)
- Alexander Gall (SWITCH)
- Christian Schild
- Coffee Room (ULP - LSIIT)
- Invenia Innovation AS
- Jerome Durand (Renater, Paris)
- Jukka Orajarvi
- Konstantin KABASSANDOV (LIP6, Paris) Windows XP
- Konstantin Kabassanov (LIP6, Paris) Windows 200
- Konstantin Kabassanov (LIP6, Paris) Linux
- Niels den Otter (SURFnet, NL)
- Stig Venaas
- Tim at IST2002
- Tomasz Szewczyk PSNC
- Wim Biemolt
- Wim Biemolt (SURFnet bv)

At the bottom of the 6NET People window, there are buttons for "Menu", "Help", and "Quit".

Overlaid on the right side of the 6NET People window is a smaller window titled "RAT v4.2.21: 6NET People". This window contains audio control settings:

- Listen: 0.0 b/s
- Talk: 0.0 b/s
- Speaker: Vol 100
- Microphone: Gain 100

Below the audio controls is a list of participants, each with a small icon and their name. The list includes:

- Jerome Durand (Renater, Paris)
- Christian Schild
- Jukka Orajarvi
- ULP - LSIIT
- Konstantin KABASSANDOV (LIP6, Paris) Windows XP
- Tomasz Szewczyk
- Konstantin Kabassanov (LIP6, Paris) Linux
- Stig Venaas
- Tina Strauf
- Konstantin KABASSANDOV (LIP6, Paris) Windows 2000 L
- Trond Skjesol (UNINETT, Trondheim)
- Tim at IST2002
- Jac Kloots (SURFnet bv)
- ridoux
- Andre Vink (Saxion Hogeschool Enschede)
- Guido Wessendorf (Univ. Muenster, ZIV)
- Wim Biemolt (SURFnet bv)
- Laetitia JACQUEY

At the bottom of the RAT window, there is a status bar with the text "6NET People" and "Address: ffd0::2:e8b8 Port: 29984 TTL: 127". There are also buttons for "Options...", "About...", and "Quit".

The Windows taskbar at the bottom shows the "démarrer" button, several application icons, and the system tray with the time "12:02".

# Applications (2)

- Mbone tools: sdr, vic, rat, nte, wb
- Freeamp patches (mp3/rtp)
- MIM (mpeg-1/mp3 over rtp)
- ttcp and iperf
- Multicast beacon (written in java), just worked for ipv6

## Available content

- Misc vic/rat sessions
- TUR (Trondheim Underground Radio)
- NRK (Norwegian national broadcasting) radio channels
- All global IPv4 multicast sessions (through gateway)