M6Bone

An IPv6 worldwide Multicast testbed

Agenda

- M6bone ?
- How to connect to ?
- Applications and services
- Monitoring IPv6 multicast
- Contact points

What's the M6Bone ?

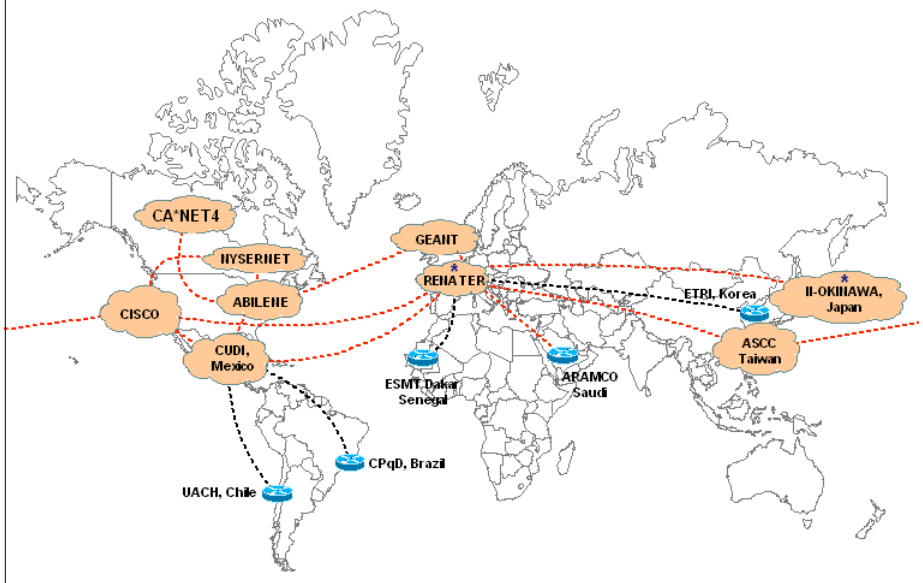
M6bone is :

- An IPv6 Multicast test network
- M6Bone started in July 2001 (Aristote association, G6 and RENATER)
- 30 networks & 60 sites

Goals :

- To offer IPv6 multicast connectivity
- Test and develop soft and equipments related to IPv6 Multicast technologies
- Be active in IPv6 multicast standardization and provide deployment recommandation (e.g. interdomain multicast)

M6Bone



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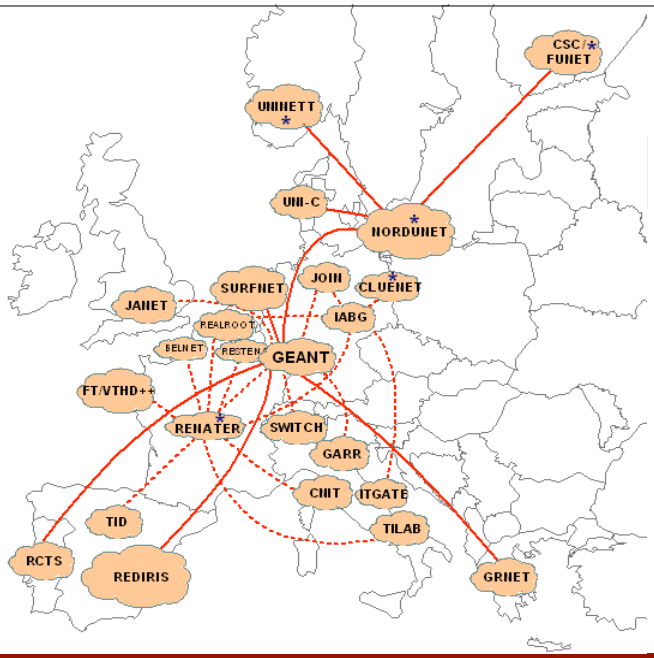
IPv6DISSemination and Exploitation

M6Bone In Europe



How to connect...

Check list

- Setup an IPv6 multicast router
- Connect to the M6bone
- Configure Routing (MBGP, static...)
- Configure PIM – Multicast topology
- Run Applications and services
- Monitoring !

1. Setup an IPv6 multicast router

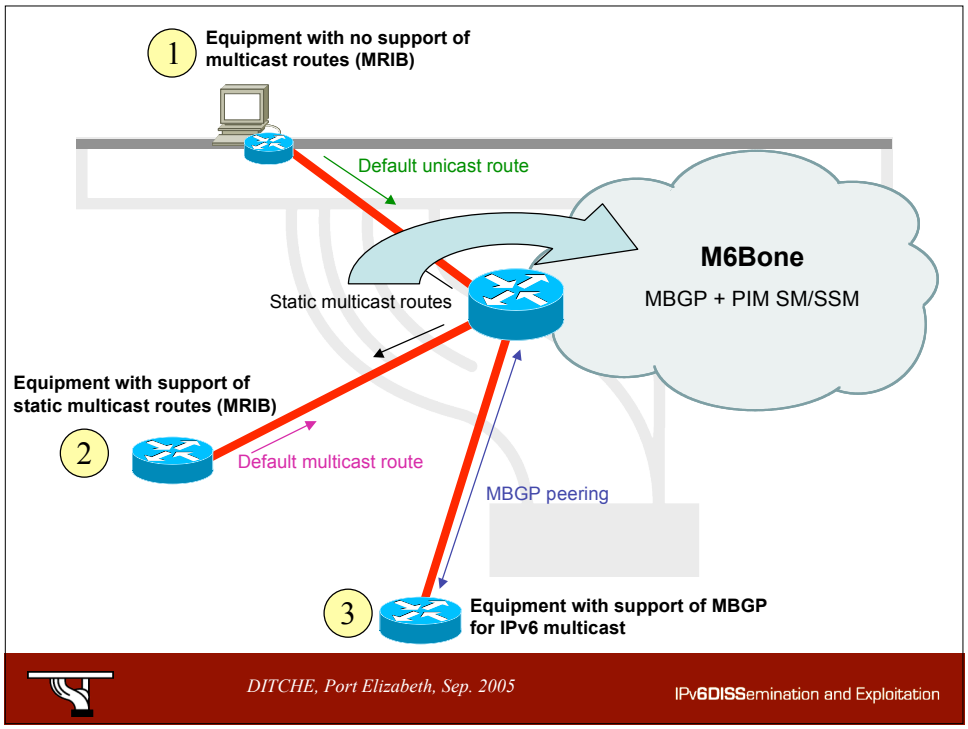
- MRIB implemented (static + MBGP)
  - CISCO
  - JUNIPER
  - PC (Linux or BSD) + MRD6
  - ... ?
- No MRIB
  - PC BSD + Kame pim6sd daemon
  - Linux + pim6sd
  - PC BSD + Xorp
  - Hitachi
  - ... ?

2. Connect to the M6Bone

- IPv6 multicast is deployed natively in some networks:
  - ABILENE
  - GEANT
  - NORDUNET
  - UNINETT
  - ...
- Need to bypass the routers not supporting IPv6 multicast
  - **IPv6 over IPv6 tunnels**
  - **IPv6 over IPv4 tunnels**
  - IPv6 over GRE over IPvX tunnels
  - Dedicated ATM PVC
  - MPLS LSPs
  - ...
- Connection to an M6Bone POP

3. Routing

- MBGP (IPv6 multicast address family)
- Static IPv6 multicast routes
- Unicast routing table
  - If unicast and multicast topologies are the same. Can be used for example inside a site.
  - If unicast and multicast topologies are different, dedicated equipments for multicast must be used (M6Bone deployment started with RIPng)


1
Equipment with no support of multicast routes (MRIB)
Default unicast route
M6Bone
MBGP + PIM SM/SSM
Static multicast routes
Equipment with support of static multicast routes (MRIB)
2
Default multicast route
MBGP peering
3
Equipment with support of MBGP for IPv6 multicast
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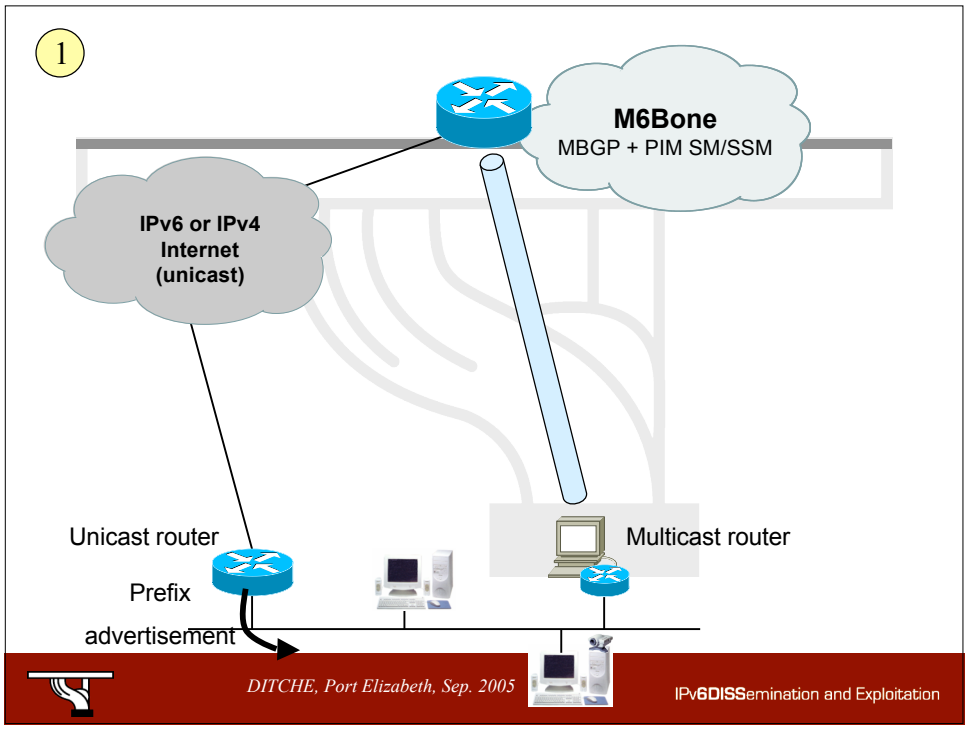
1
M6Bone
MBGP + PIM SM/SSM
IPv6 or IPv4 Internet (unicast)
Unicast router
Prefix advertisement
Multicast router
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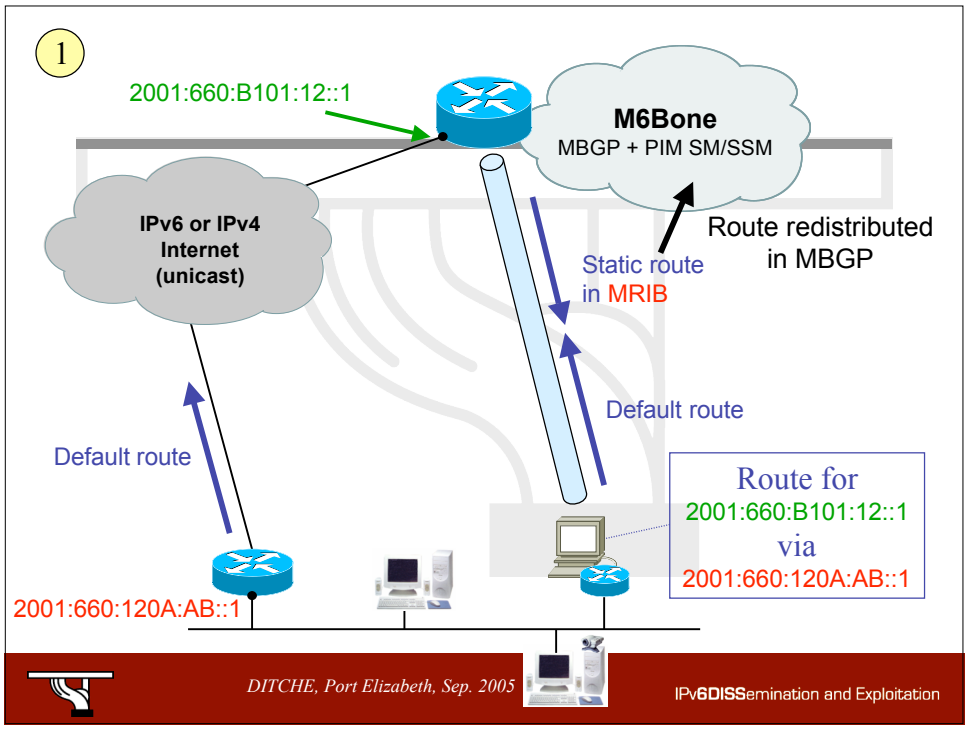
1
2001:660:B101:12::1
M6Bone
MBGP + PIM SM/SSM
IPv6 or IPv4
Internet
(unicast)
Route redistributed
in MBGP
Static route
in MRIB
Default route
Default route
Route for
2001:660:B101:12::1
via
2001:660:120A:AB::1
2001:660:120A:AB::1
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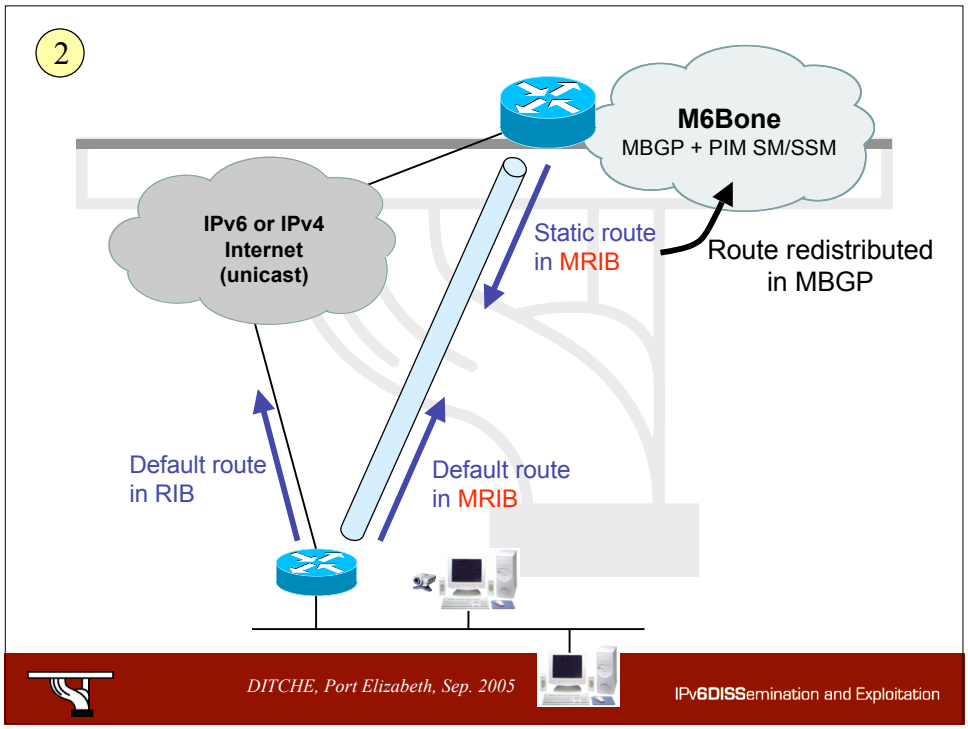
2
M6Bone
MBGP + PIM SM/SSM
IPv6 or IPv4
Internet
(unicast)
Static route
in MRIB
Route redistributed
in MBGP
Default route
in RIB
Default route
in MRIB
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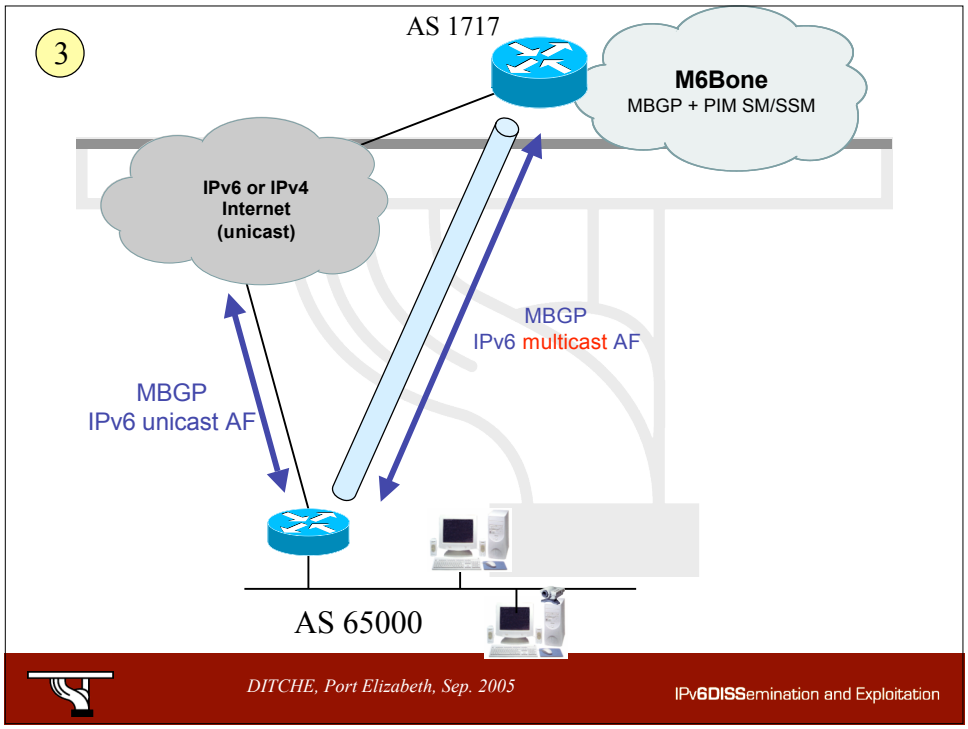


Routing policy

- Few ISPs provide IPv6 multicast service
  - No possible to do the same aggregation for unicast and multicast
  - Transit networks must allow up to /48 prefixes
  - Sites must aggregate to /48 prefixes
- BGP peerings
  - No private AS advertised in M6Bone

4. PIM – Multicast topology

- PIMv2 SM / SSM
  - SSM for FF3X::/96 group-range
  - SM for others
- No MSDPv6 available
  - Will never be as bottleneck in IPv4 world
- M6Bone is / was a single PIM domain
  - Embedded RP is being deployed

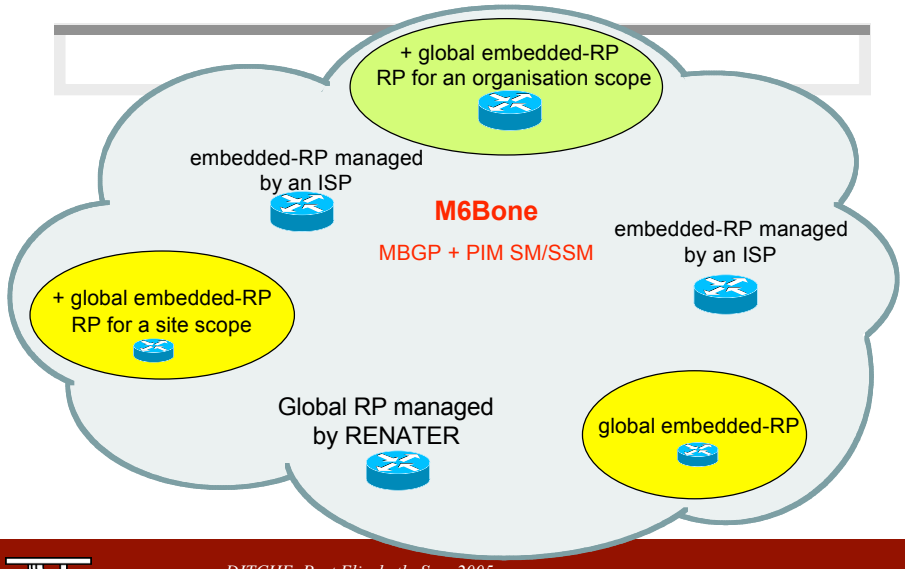
4. PIM – Multicast topology

- Hierarchical RPs
  - Global RP managed by RENATER
  - NREN RPs
  - Sites RP in some universities
- Global RP in RENATER
  - Must be known on all the M6Bone routers
    - Statically configured, the safe way
    - BSR
      - Scoped BSR deployed in 6NET. Some 6NET partners use BSR to receive RP information
      - Old BSR deployed in MRIP
  - Works now since there are only few sites connected

4. PIM – Multicast topology

- Embedded RP under deployment
  - RFC 3956
  - A new group-to-RP mapping mechanism
  - RP address embedded in IPv6 multicast address
  - FF70::/12 address space
- Changes the model
  - Need to understand consequences for ISPs and customers
- SSM
  - The M6Bone network is ready for SSM
  - Few applications available / used

4. PIM – Multicast topology



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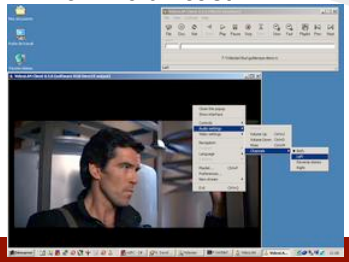
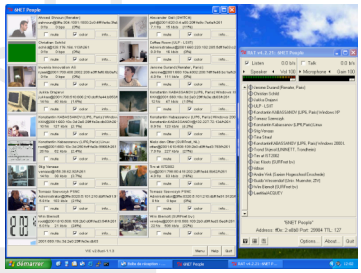
5. Applications & services

- Every IPv6 stack supports MLD
  - Necessary to run IPv6 multicast applications
  - MLDv2 on Linux, FreeBSD, Solaris
  - No MLDv2 support on Windows
  - Any platform can be used for IPv6 multicast
- Almost no application supports MLDv2
  - Is relatively new
  - Implementations will come with the need

5. Applications & services /2

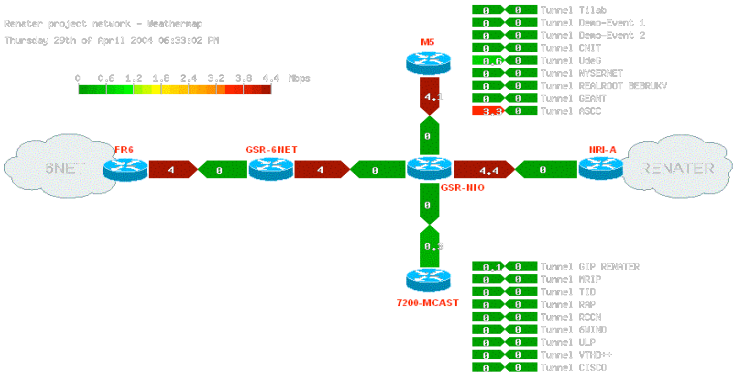
- Videoconferencing : VIC/RAT, Videolan, Isabel, WM player, conference XP
- Radio broadcast : Freeamp
- Others : NTE, WB, MAD, SDR
- Reflectors
  - To / from IPv4 multicast
  - To IPv6 unicast





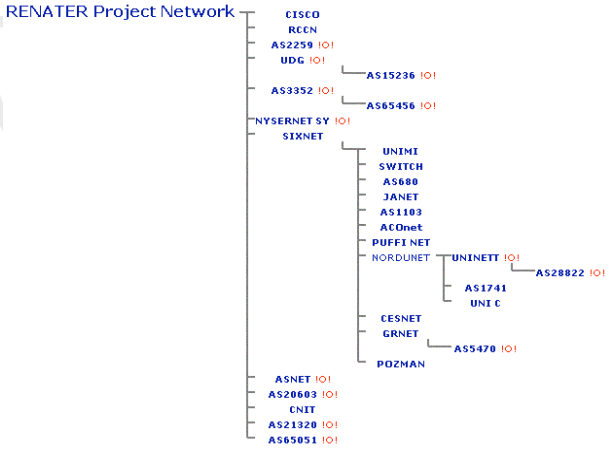
6. Monitoring IPv6 Multicast

- Connectivity / Traffic
  - Ping6 & SNMP
  - Weathermaps



6. Monitoring /2

- Routing
  - AS-Path-Tree



6. Monitoring /3

- PIM – Multicast topology
  - DBeacon

Loss [%]	S0	S1	S2	S3	S4	S5	S6
R0 zephyr.ipv6.unige.ch							
R1 UoS			0.0	0.0	2.0	0.0	
R2 merapi.switch.ch		0.0		0.0	0.0	0.0	
R3 UdeG-Mexico		0.0	0.0		0.0	0.0	
R4 tut.fi_telecom_lab		0.0	0.0	0.0		0.0	
R5 RENATER		0.0	0.0	0.0	0.0		
R6 beacon-test.geant.net		0.0		0.0	0.0	0.0	

SSMPING (IPv4 & IPv6)

- A tool for testing SSM connectivity
- Behaviour is a bit like normal ping
- A server must run ssmpingd
  - A client can ping a server by sending unicast ssmping query
  - Server replies with both unicast and multicast ssmping replies
- In this way a client can check that it receives SSM from the server
  - And also parameters like delay, number of router hops etc.
  - Supports both IPv4 and IPv6
- See http://www.venaas.no/multicast/ssmping/ for more info
- Can be linked to dbeacon (matrix displays then dbeacon results)

SSMPING (IPv4 & IPv6)

- Tests the SSM connectivity

```
> ssmping ssmping.uninett.no ssmping joined (S,G) =
   (2001:700:1:7:211:d8ff:fe8f:1f9b,ff3e::4321:1234) pinging S from
   2001:630:d0:111:250:fcff:fe6a:42b3
unicast from 2001:700:1:7:211:d8ff:fe8f:1f9b, seq=0 dist=20 time=57.106 ms
unicast from 2001:700:1:7:211:d8ff:fe8f:1f9b, seq=1 dist=20 time=56.929 ms
unicast from 2001:700:1:7:211:d8ff:fe8f:1f9b, seq=2 dist=20 time=62.466 ms
multicast from 2001:700:1:7:211:d8ff:fe8f:1f9b, seq=2 dist=12 time=65.706 ms
unicast from 2001:700:1:7:211:d8ff:fe8f:1f9b, seq=3 dist=20 time=57.226 ms
multicast from 2001:700:1:7:211:d8ff:fe8f:1f9b, seq=3 dist=12 time=59.455 ms
          --- 2001:700:1:7:211:d8ff:fe8f:1f9b ssmping statistics ---
5 packets transmitted, time 4744 ms
unicast: 4 packets received, 0% packet loss rtt min/avg/max/std-dev =
   56.090/57.963/62.466/2.296 ms
multicast: 2 packets received, 50% packet loss 0% loss since first multicast
   packet received (after 2067 ms) rtt min/avg/max/std-dev =
   58.956/61.372/65.706/3.077 ms $
```

Contacts

- M6bone-team@renater.fr
- Web-site : http://www.m6bone.net
  - Collaborative web-site
  - Architecture of the network
  - Maps
  - Information about equipment's configuration
  - Subscription form
- Mailing list : m6bone@ml.renater.fr
  - Around 220 active and experienced people ready to help you