Poznan Supercomputing and Networking Center

Multicast monitoring and visualization tools

A. Binczewski
R. Krzywania
R. Łapacz

Multicast technology now - briefly

Bright aspects:

- Well-known technology
- Reduces network traffic and conserves the bandwidth
- IPv4 and IPv6 support
- Suitable for multimedia streaming services

Problems:

- Access for end user (last mile problem; small bandwidth)
- **Small number of advanced monitoring/managing tools (making up the multicast monitoring platform)**

Well-known multicast monitoring tools - examples

- **Command line tools**
  - mtrace
  - mrinfo
- **Open-source applications**
  - MRTG
  - MHealth
  - RTPMon
  - MultiMon
  - Multicast Beacon
- **Commercial proposal**
  - Network Node Manager Multicast 2.0 (NNM Multicast) by Hewlett-Packard Company

Multicast Beacon Application

Active measurement of QoS parameters:

- loss (%)
- delay (ms)
- jitter (ms)
- order (%)
- duplicate (%)

Beacon	IP
R0 Hiof	eth0: 2001:700:a00:5:0:0:0:3, fe80:0:0:0:202:b3ffe88:b34d, eth2: fe80:0:0:0:201:2ffe18:d411, 158.36.47.188, eth1: fe80:0:0:0:202:b3ffe4c:5113, 192.168.1.100,
R1 UoS	eth0: 2001:630:d0:122:230:48fffe11:cea9, 2001:630:d0:132:230:48fffe11:cea9, fe80:0:0:0:230:48fffe11:cea9,
R2 SURFnet_M6Bone	eth0: 3ffe:666:3ffe:168:2c0:4ffffe84:de68, fe80:0:0:0:2c0:4ffffe84:de68, 192.87.110.171,
R3 SURFnet_M6Net	eth0: 3ffe:666:3ffe:176:2c0:4ffffea4:d53f, fe80:0:0:0:2c0:4ffffea4:d53f, 192.87.110.178,
R4 UNINETT	eth0: fe80:0:0:0:290:27ffe50:6bfa, 2001:700:e000:0:290:27fffe50:6bfa, 158.38.63.20,
R5 PSNC	eth0: 3ffe:8320:5:101:210:4bfffe91:9120, fe80:0:0:0:210:4bfffe91:9120, 150.254.162.225,
R6 UCL	eth0: fe80:0:0:0:250:daffffe38:cab5, 3ffe:2101:7:4:250:daffffe38:cab5, 128.16.64.165,

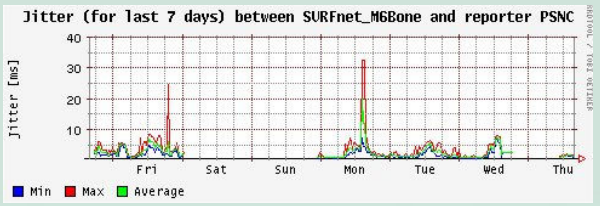
Multicast Beacon

[Loss] [Delay] [Jitter] [Order] [Duplicate] [Clients Info] [History] [Mtrace]

Time: **Thu Mar 27 15:31:47 CET 2003**
Target: **ff0e::8320:1:56465**

Nr of Beacon clients: **7**
Page refresh: **60 seconds**

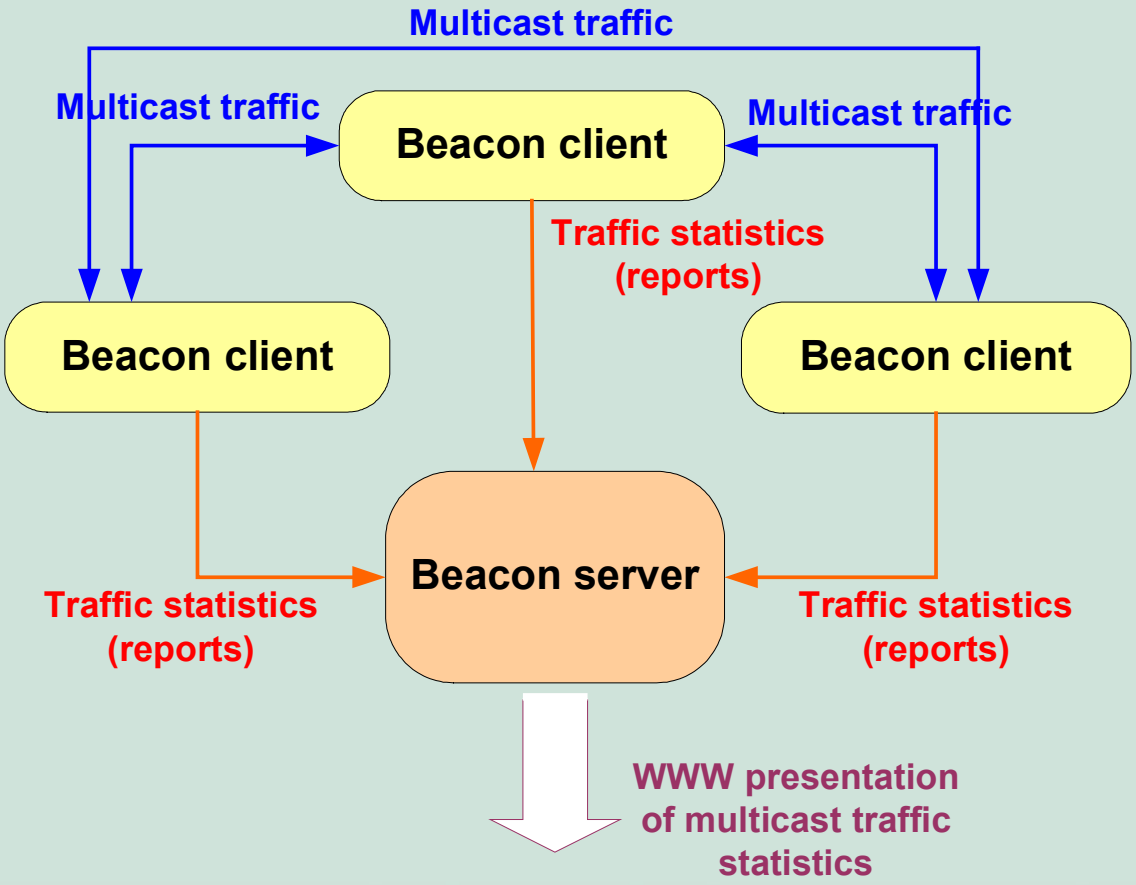
Loss [%]	S0	S1	S2	S3	S4	S5	S6
R0 Hiof							
R1 UoS	0.0		5.0	0.0	0.0	0.0	0.0
R2 SURFnet_M6Bone	99.0	97.0		99.0	99.0	99.0	0.0
R3 SURFnet_M6Net	0.0	0.0	0.0		0.0	99.0	0.0
R4 UNINETT	0.0	0.0					
R5 PSNC	0.0	0.0	0.0	0.0	0.0		0.0
R6 UCL	0.0	0.0	0.0	0.0	5.0	0.0	



Multicast Beacon - overview

- Application created by The **N**ational **L**aboratory for **A**pplied **N**etwork **R**esearch (NLANR) USA
- OS platform independent (Java application)
- client-server architecture
  - clients exchange packets (with time stamps) using multicast technology and calculate traffic parameters
  - server acquires values of traffic parameters from clients and presents them to the user
- Open-source license allows adding or improving application modules

Multicast Beacon - architecture



Multicast Beacon in PSNC

Extensions provided by PSNC:

- History module (storing parameres values)
- Trigger message module (notifying about multicast traffic behaviour)
- Statistic charts generation (use of RRDTool for chart presentation)
- Mtrace module (only for IPv4, use of exterior mtrace tool)
- IPv6 adjustment (IPv6 address presentation)
- Code improvement

Deployment of Multicast Beacon

- POL34 (Poland)
- Géant (Dante)
- M6bone (ipv6 network)

Multicast Beacon – future

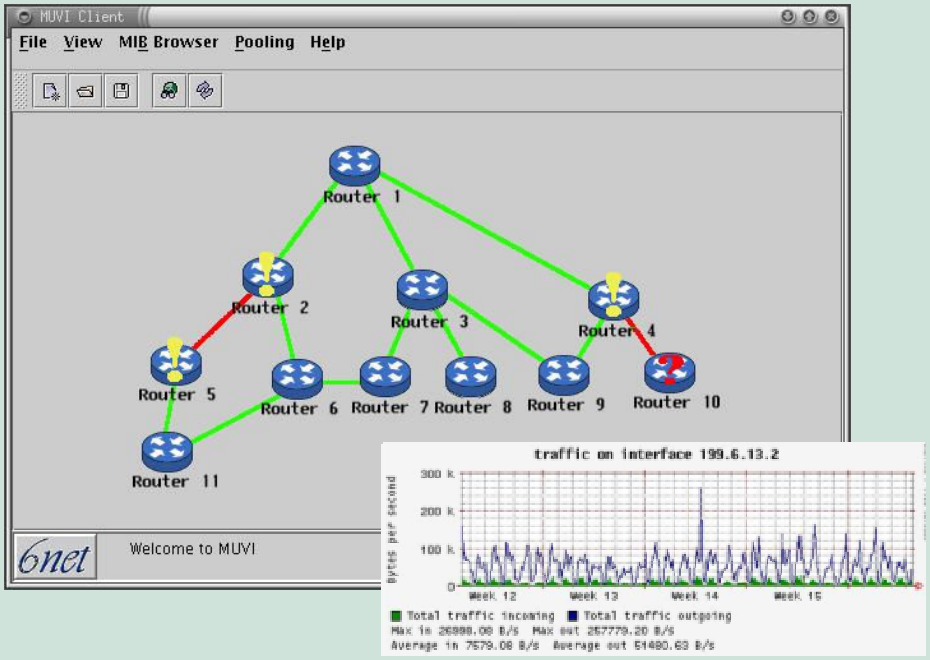
New ideas:

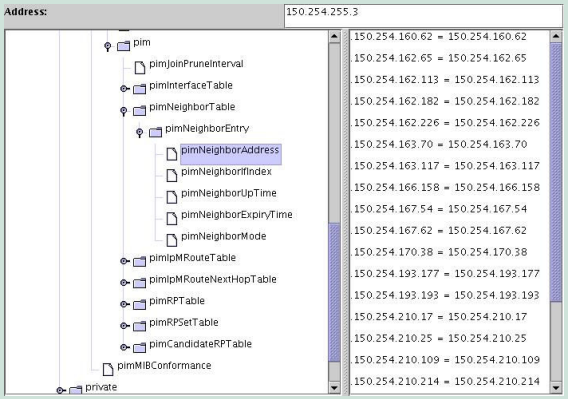
- SNMP interface
- New protocol for communication between clients and server
  - Version autoconfiguration – client checks version being used by the server, if it is a new one automatically download apropriate binaries from the server to use current version
  - Use of XML
- GRID utilization - monitor multicast routes between nodes of a grid

Multicast Visualization Tool (MUVI) - new proposal from PSNC

MUVI – Multicast Visualization Tool

Multicast network discovery, visualization and monitoring tool.





Time	Type	Message	Node
Fri Apr 18 10:32:09 ...	Interface DOWN	150.254.255.3 is down	Router2
Fri Apr 18 10:33:09 ...	Interface UP	150.254.255.3 is up	Router2
Fri Apr 18 10:36:14 ...	Interface DOWN	150.254.255.4 is down	Router4
Fri Apr 18 10:37:14 ...	Interface DOWN	150.254.255.3 is down	Router2
Fri Apr 18 10:52:14 ...	Interface UP	150.254.255.4 is up	Router4
Fri Apr 18 10:53:14 ...	Interface UP	150.254.255.3 is up	Router2
Fri Apr 18 10:56:14 ...	Interface DOWN	150.254.163.12 is down	Router10

MUVI – overview

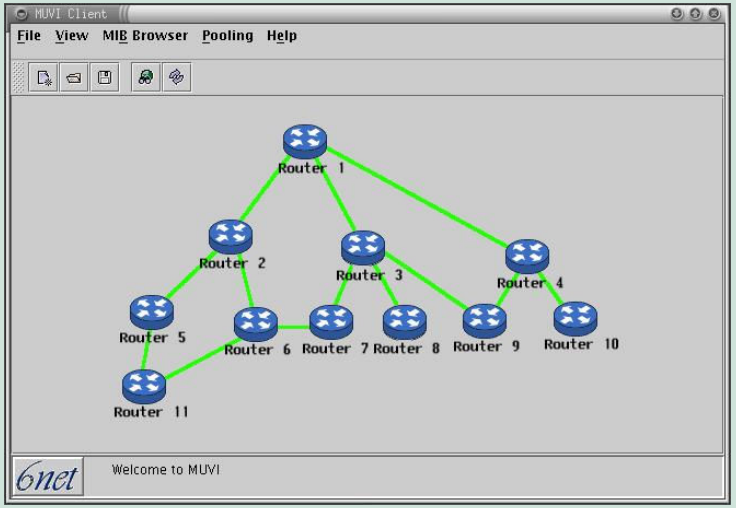
- Incorporates SNMP protocol (freeware SNMP library by Westhawk)
- Uses RRDTool as a data storage and chart generator
- Platform independent (Java application)
- Open-source application

MUVI features

- Multicast network topology discovery
- Routers connections and availability monitoring
- Event message generation
- Statistics collection
- Simple MIB browser
- IPv6 support

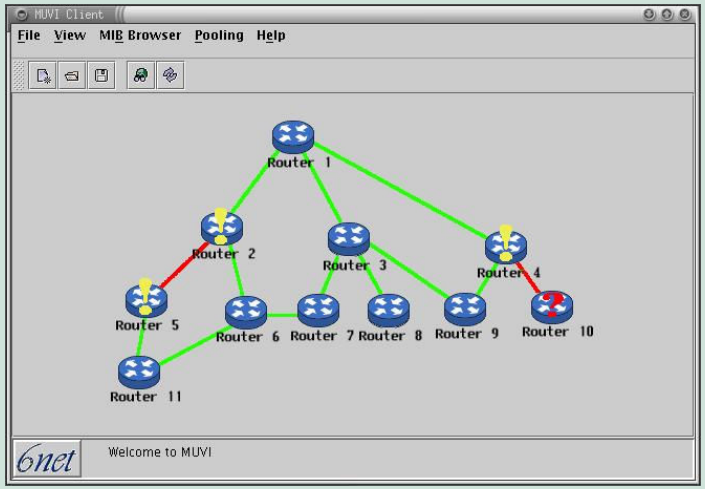
MUVI features – multicast network topology discovery

- Uses SNMP messages to query for router's multicast PIM neighbors
- Displays discovered logical topology in the application panel
- Allows the administrator to rearrange elements in the discovered topology layout



MUVI features – Routers connections and availability monitoring

- Decorates router's icon according to router's status
- Automatically marks unavailable connections
- Map can be filtered in order to show one multicast group only



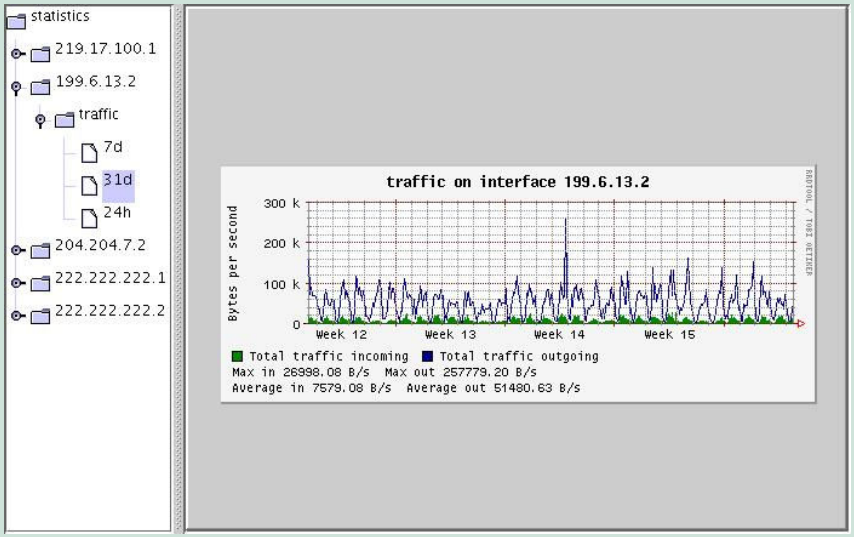
MUVI features – event message generation

- **Messages** are associated with router's state changes
- Stored in table for easy browsing
- Presented in clear manner (application distinguishes types of messages using colors)
- The administrator is notified via e-mail system

Time	Type	Message	Node
Fri Apr 18 10:32:09 ...	Interface DOWN	150.254.255.3 is down	Router2
Fri Apr 18 10:33:09 ...	Interface UP	150.254.255.3 is up	Router2
Fri Apr 18 10:36:14 ...	Interface DOWN	150.254.255.4 is down	Router4
Fri Apr 18 10:37:14 ...	Interface DOWN	150.254.255.3 is down	Router2
Fri Apr 18 10:52:14 ...	Interface UP	150.254.255.4 is up	Router4
Fri Apr 18 10:53:14 ...	Interface UP	150.254.255.3 is up	Router2
Fri Apr 18 10:56:14 ...	Interface DOWN	150.254.163.12 is down	Router10

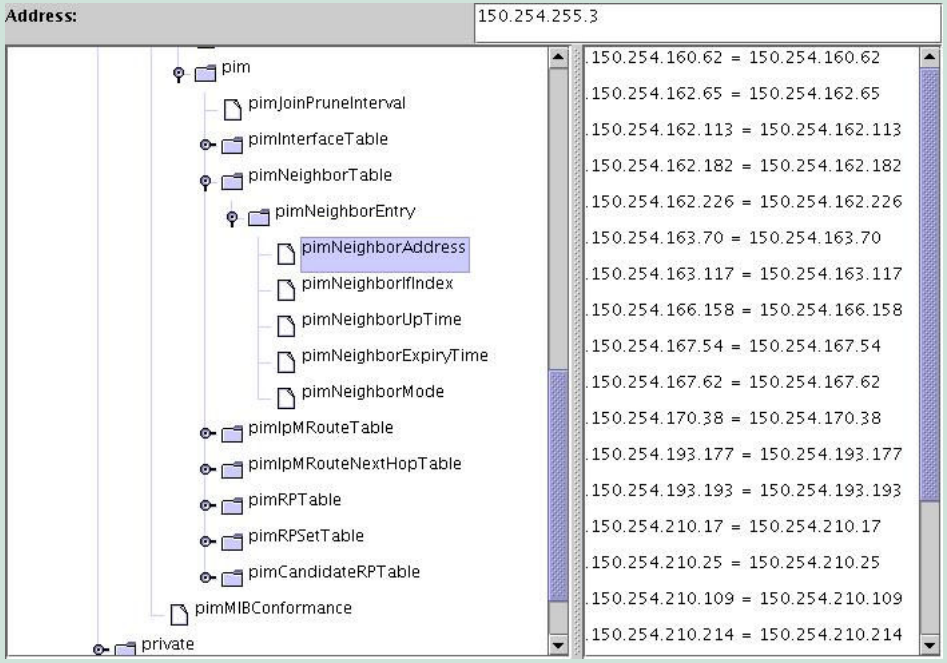
MUVI features – Statistics collection

- Statistic charts (RRDTool)
- Group-based statistic management
- Flexible configuration (Drag&Drop feature)



MUVI features – MIB browser

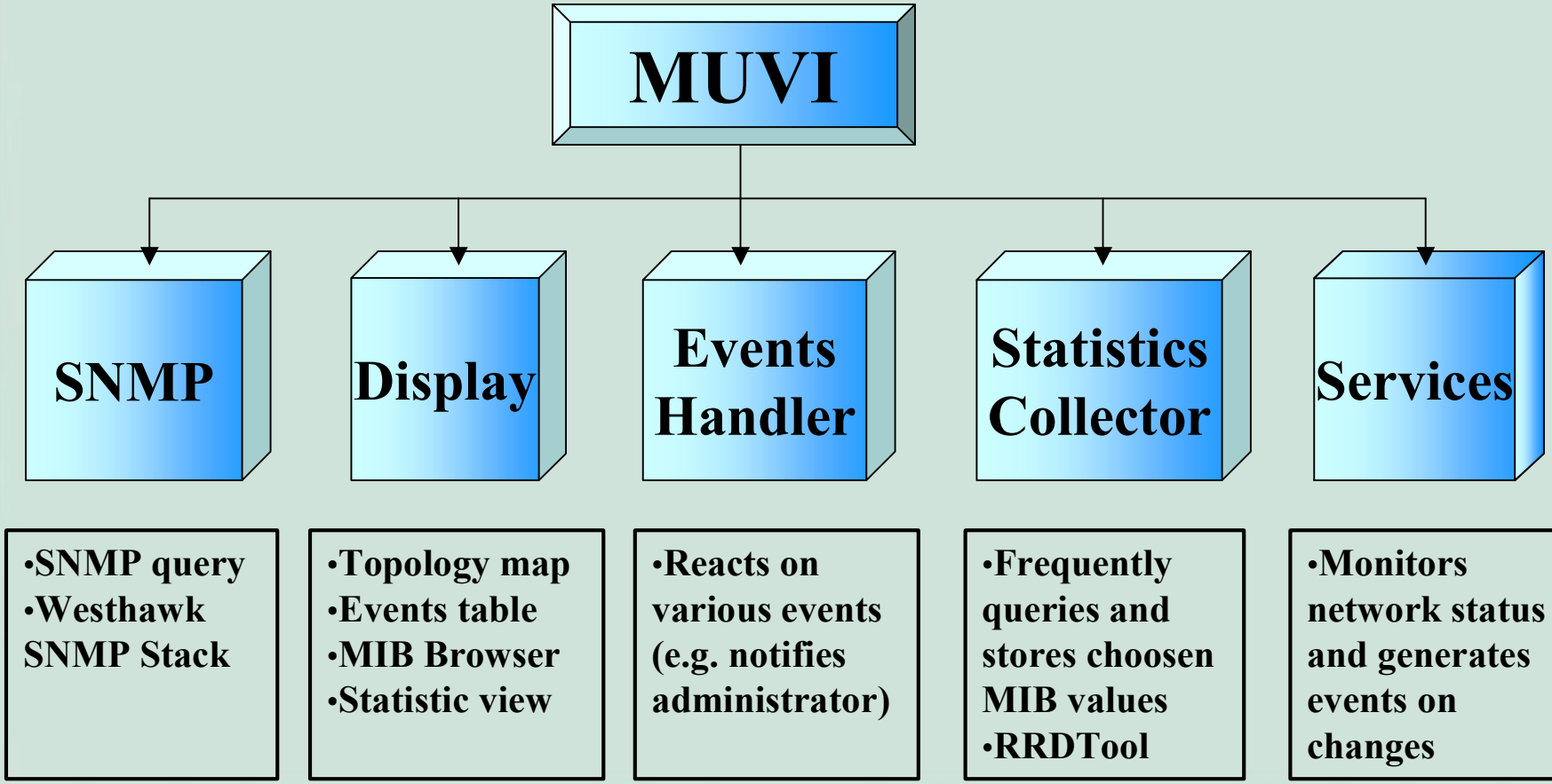
- Simple MIB browser is available and allows to query router MIBs



MUVI features – IPv6 support

- SNMP queries via IPv6 were successfully tested in PSNC
- Complete IPv6 support will be achieved after some modification to understand correctly IPv6 MIB values
- Java IPv6 feature

MUVI modular architecture



MUVI vs NNM Multicast (HP)

Feature	NNM	MUVI
Multicast network discovery	Yes	Yes
Multicast group filtering	Yes	Yes
Multicast traffic flow tracking	Yes	Planned
Multicast traffic measurements	Yes	Planned
Alarm generation on failures	Yes	Yes
Graphical topology display	Yes	Yes
Statistic collection	Yes	Yes
Standalone application	No	Yes
Non comercial (open-source)	No	Yes
Hardware & OS independent	No	Yes

MUVI – conlusion

MUVI is a robust tool to present and monitor the multicast network. It could be an important element of multicast monitoring platform.

What we plan to do in the near future:

- Code will be freely available in the Internet
- The algorithm of network topology presentation will be improved
- New implementation of remote viewers (Java applet or stand-alone client)
- RRDTool will be accessed through JNI

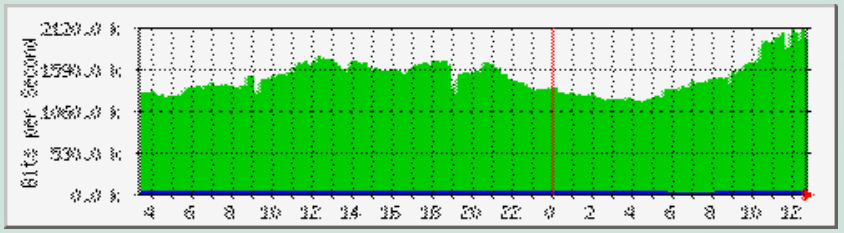
Thank you

Contact:

Artur Binczewski, artur@man.poznan.pl
Radosław Krzywania, sfrog@man.poznan.pl
Roman Łapacz, romradz@man.poznan.pl

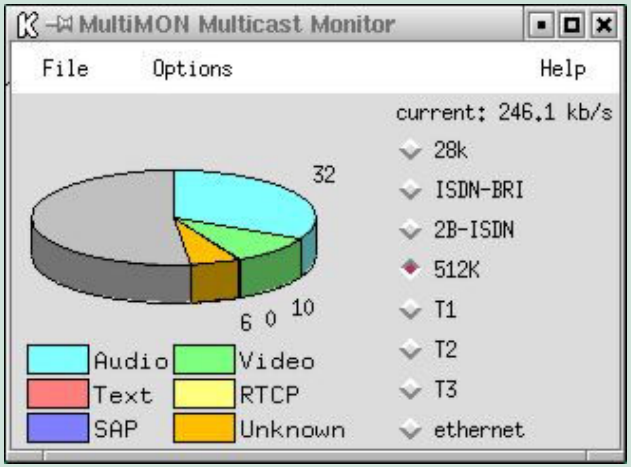
Multicast monitoring tools – examples (1)

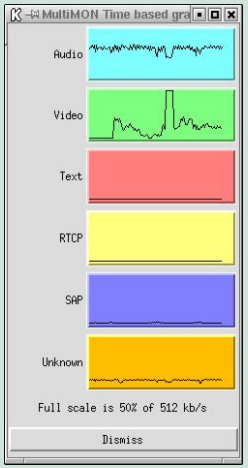
- **Mtrace** traces a route from a receiver to a source working backwards using a selected multicast address
- **Mrinfo** displays information about the multicast enabled router (retrives information about multicast router interfaces and neighbors)
- **The Multi Router Traffic Grapher** (MRTG) - monitors the traffic load on the network-links

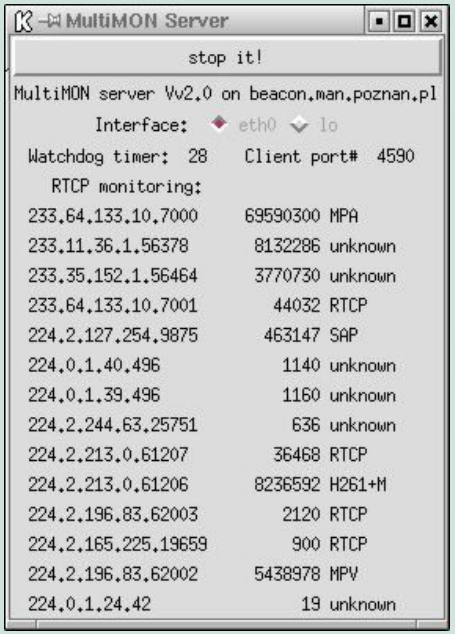


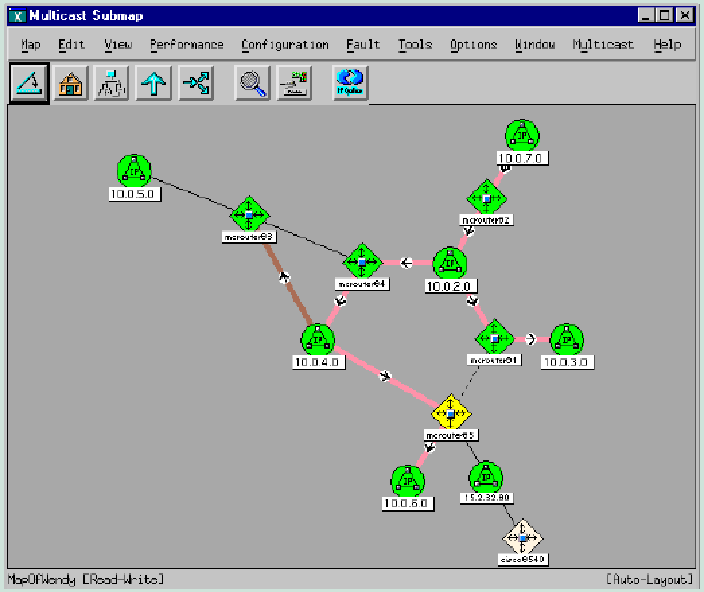
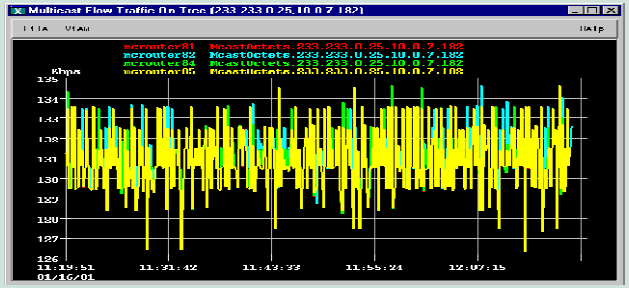
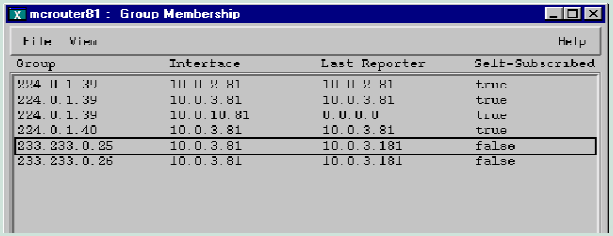
Multicast monitoring tools – examples (2)

- **MultiMon** - collects, organises and displays information about the IP multicast traffic that is detected (tcpdump) at the location of the MultiMON Server







Multicast monitoring tools – examples (3)

- **Network Node Manager Multicast 2.0** – provides tools to create map of multicast network and monitor it (statistics, event notification).