



CN-MAS

Core Network

Multicast Algorithm Simulator

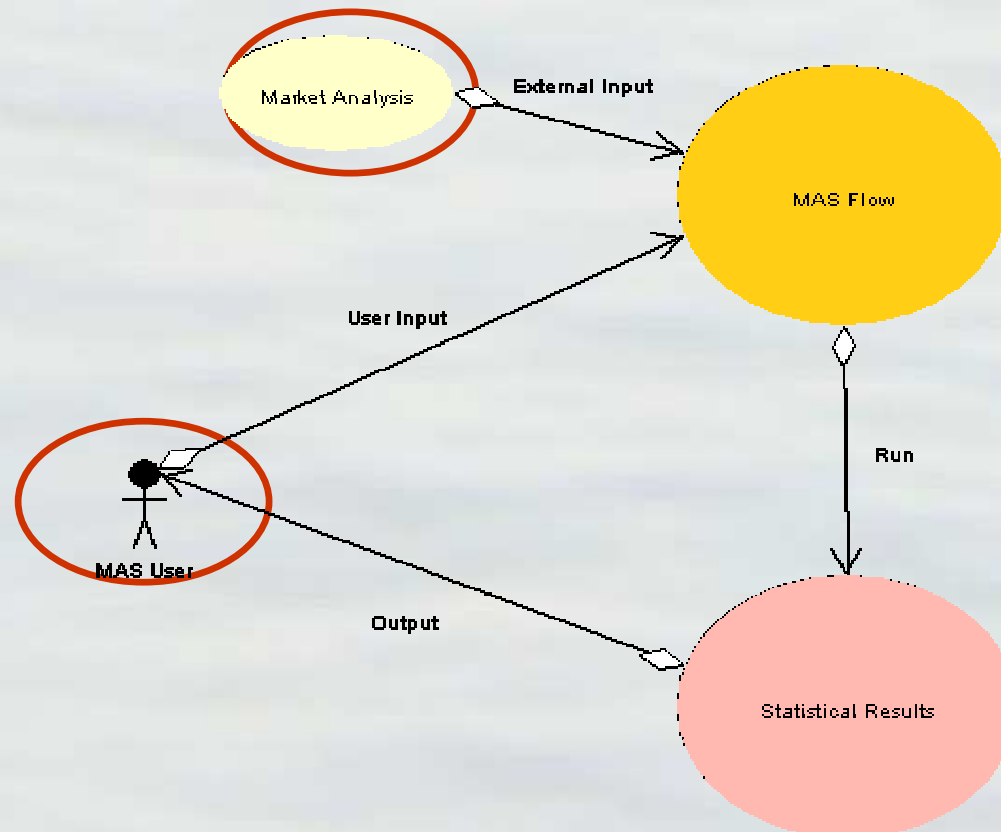
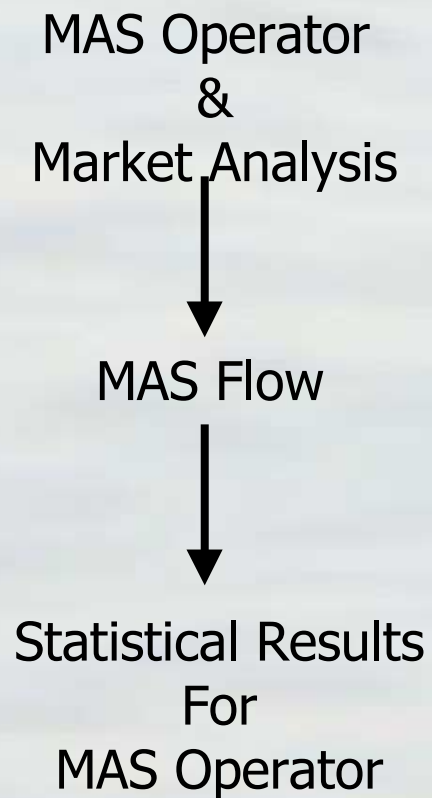
Bergeggi, October 28, 2004

Speaker: Rosario Toscano (rosario_toscano@telespazio.it)

MAS Purposes

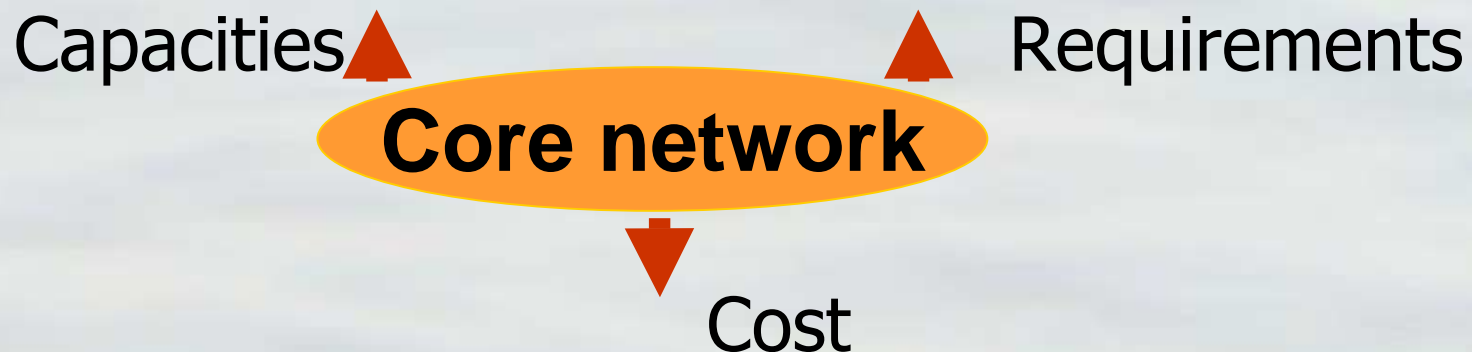
- w Simulate the behaviour of UMTS user traffic in a fully IP network
- w Verify the validity of selected Multicast algorithms
- w Provide statistically assessed results regarding network, QoS and algorithms

MAS Approach

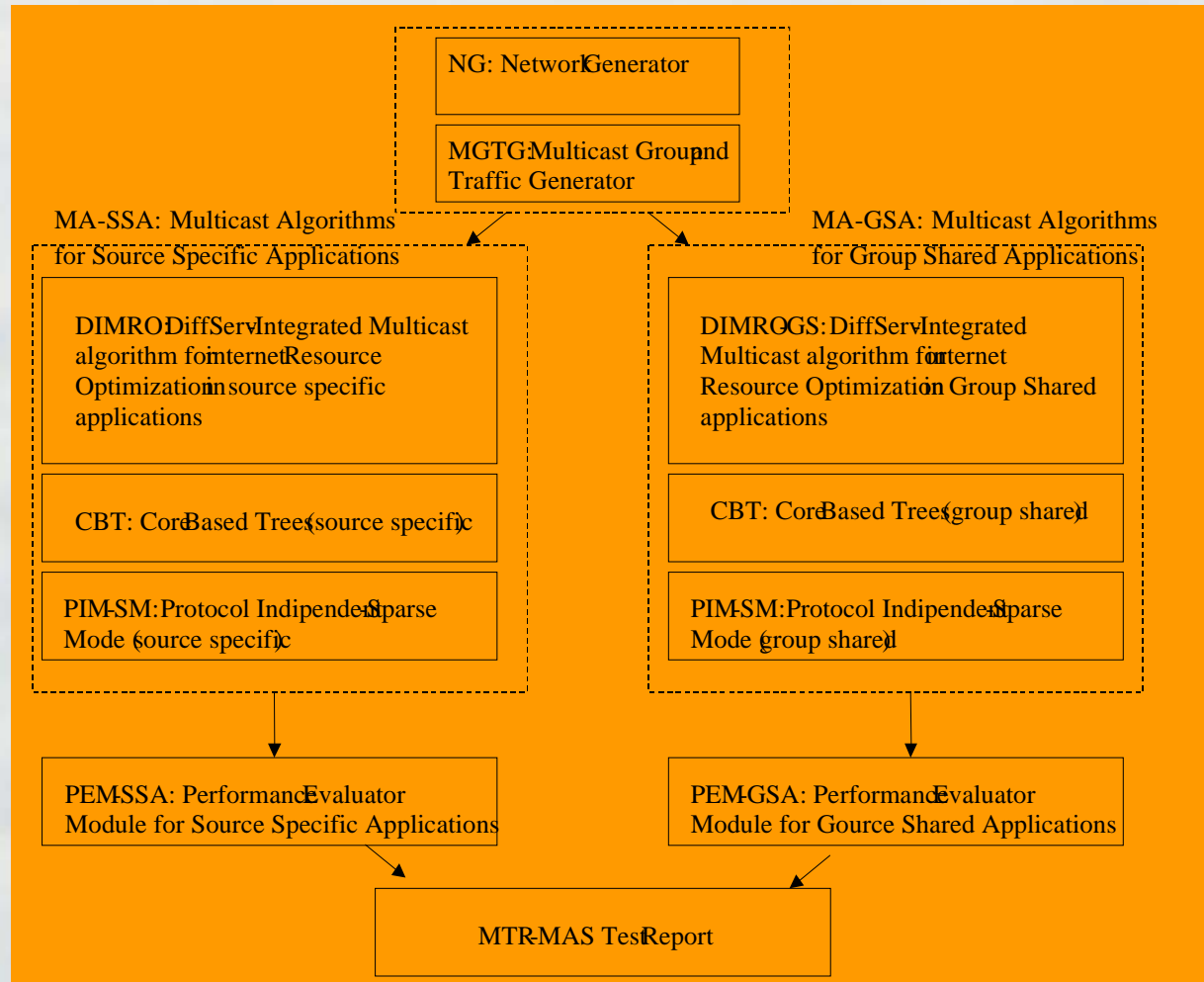


MAS Design

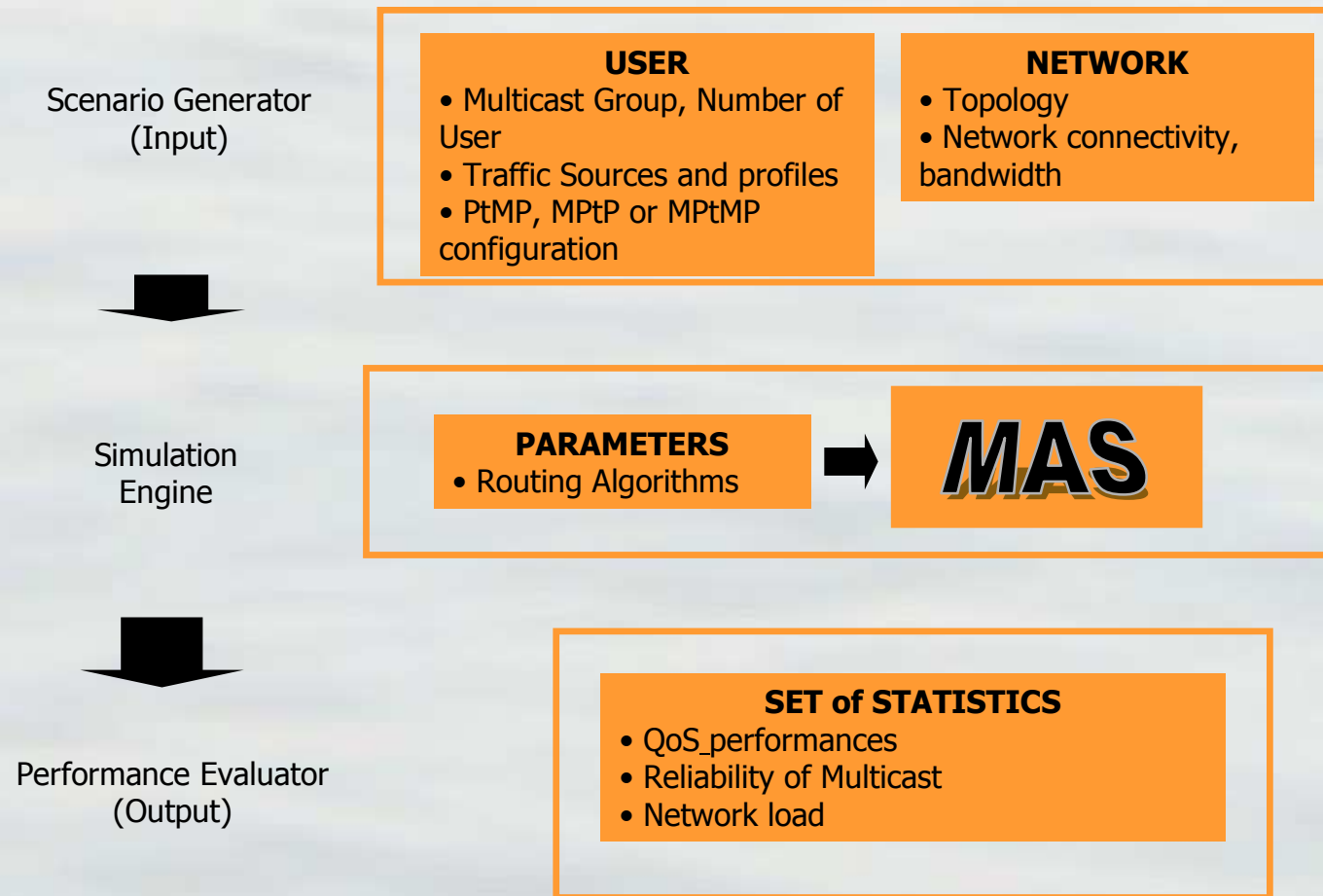
- The **SAILOR Project** context
 - MAS is based on a fully **IP Core Network**
 - RASN is simulated as a node that generates multicast traffic statistically modelled
 - network optimisation is focused on the IP core network separately from the UMTS access network



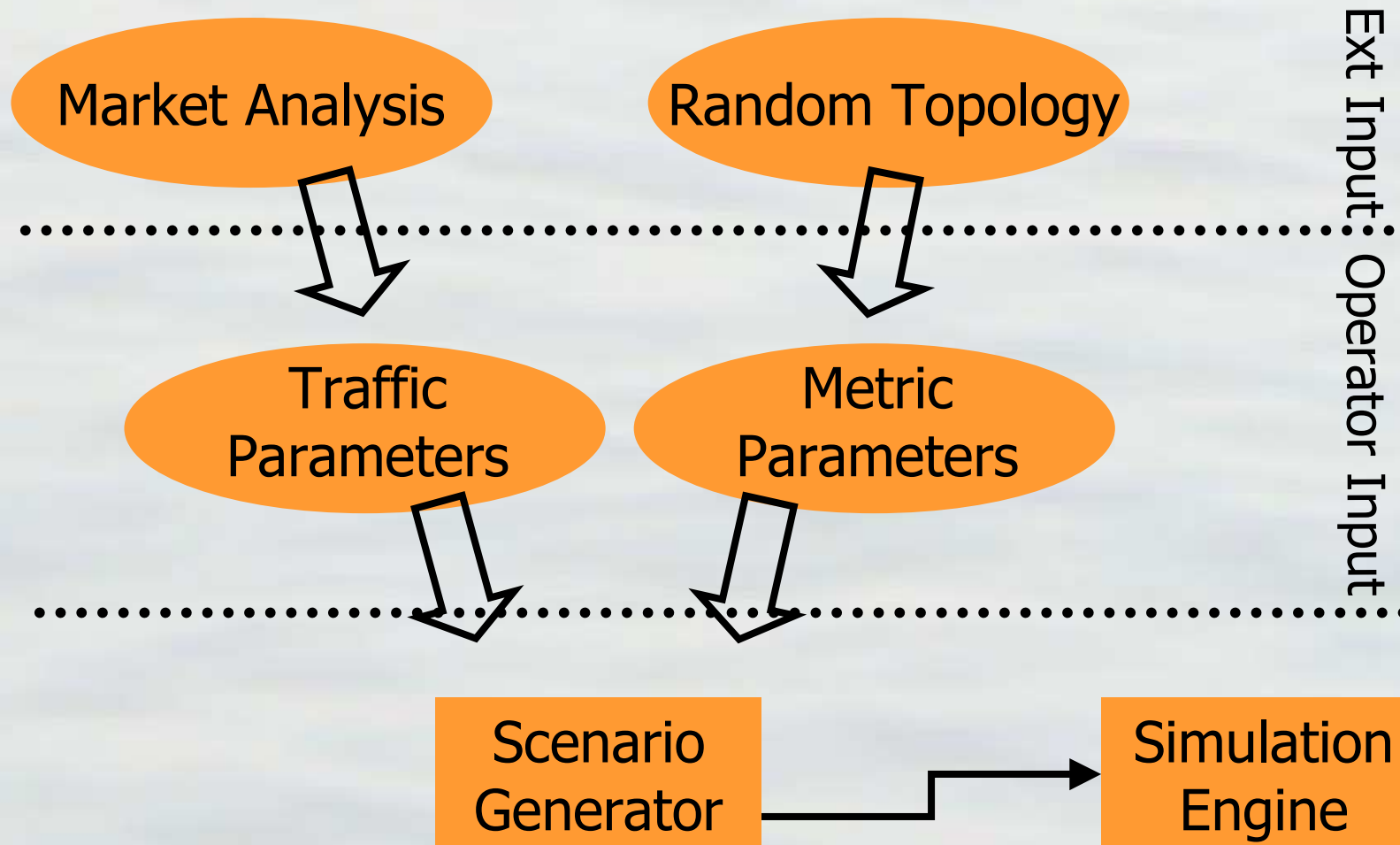
MAS module definition



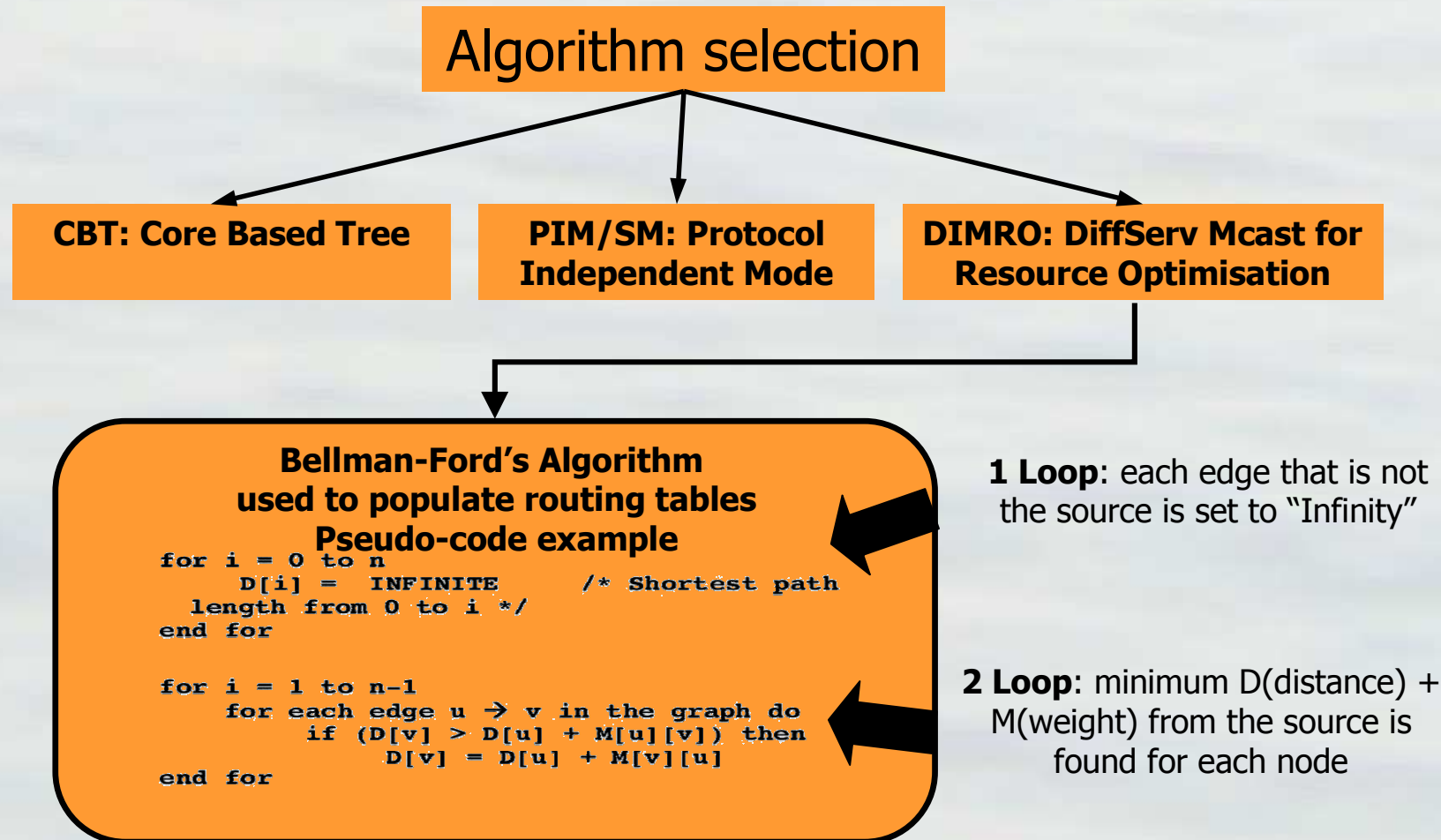
MAS Flow



MAS Module – Scenario Generator



MAS Module – Simulation Engine

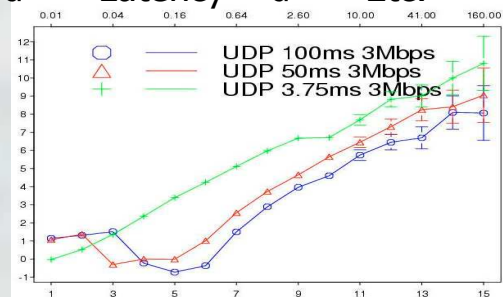


MAS Module – Performance Evaluator

Trace Software Monitor

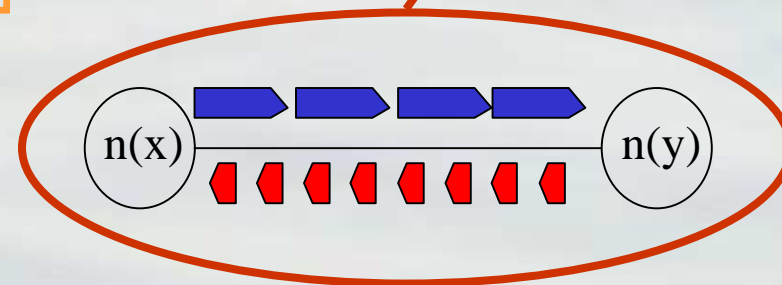
Plots of meaningful parameters

- ü Time Delayü Packet Loss
- ü Bandwidthü Tree Stability
- ü Latency ü Etc.



**Algorithm Performance
&
Network Performance**

NAM Network Animation Monitor





MAS software module decomposition

- Network Generator (NG) module
- Multicast Group and Traffic Generator (MGTG) module
- MAS Test Report (MTR) module

Network Generator (NG) module

To ensure a fairly evaluation of different multicast routing algorithms a random network will be generated according to the Waxman's model.

In the Waxman's model nodes in the network are distributed at random across a Cartesian coordinate grid.



Multicast Group and Traffic Generator (MGTG) module

Four general service classes:

- Conferencing
- Messaging
- Web Browsing & Internet/Intranet
- Streaming and Data transfer

Which configurations?

Point to Multipoint (PtMP), Multipoint to Point (MPtP)
and Multipoint to Multipoint (MPtMP)

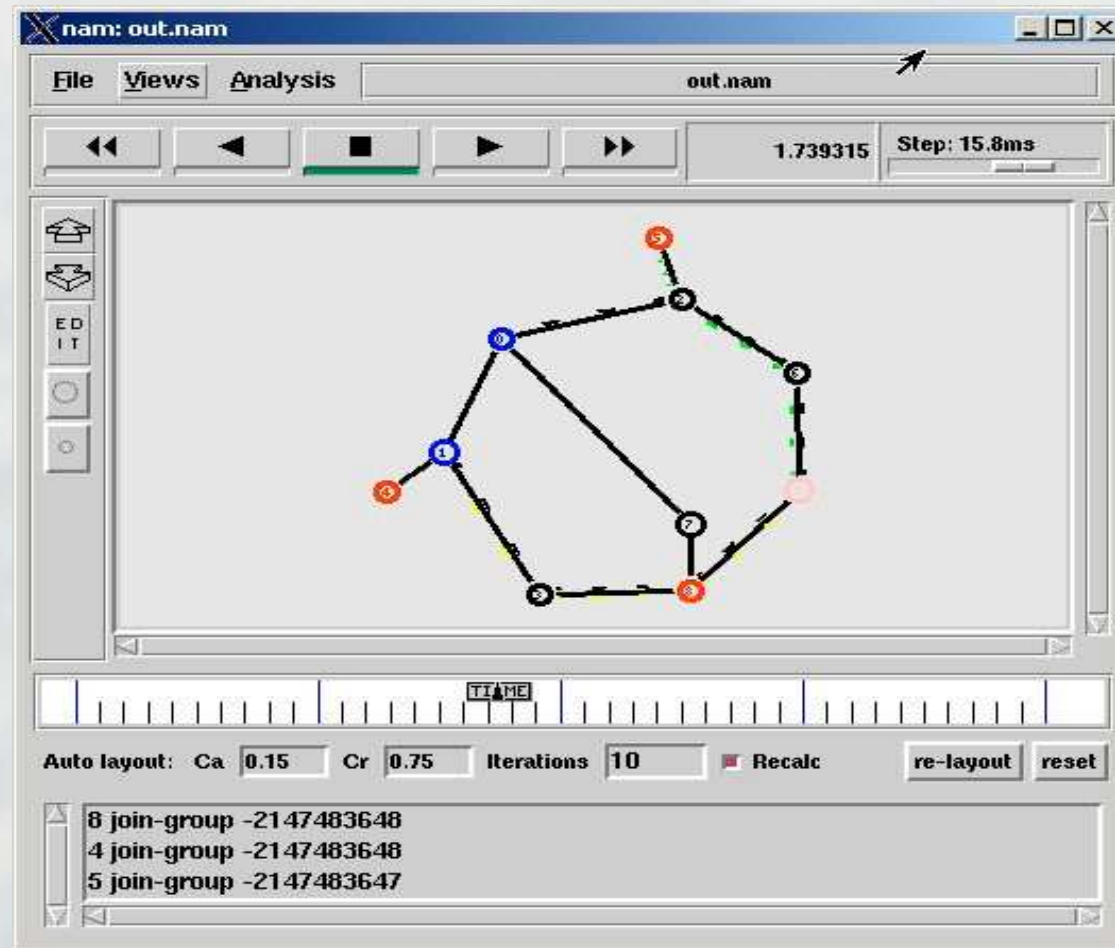


MAS Test Report (MTR) module

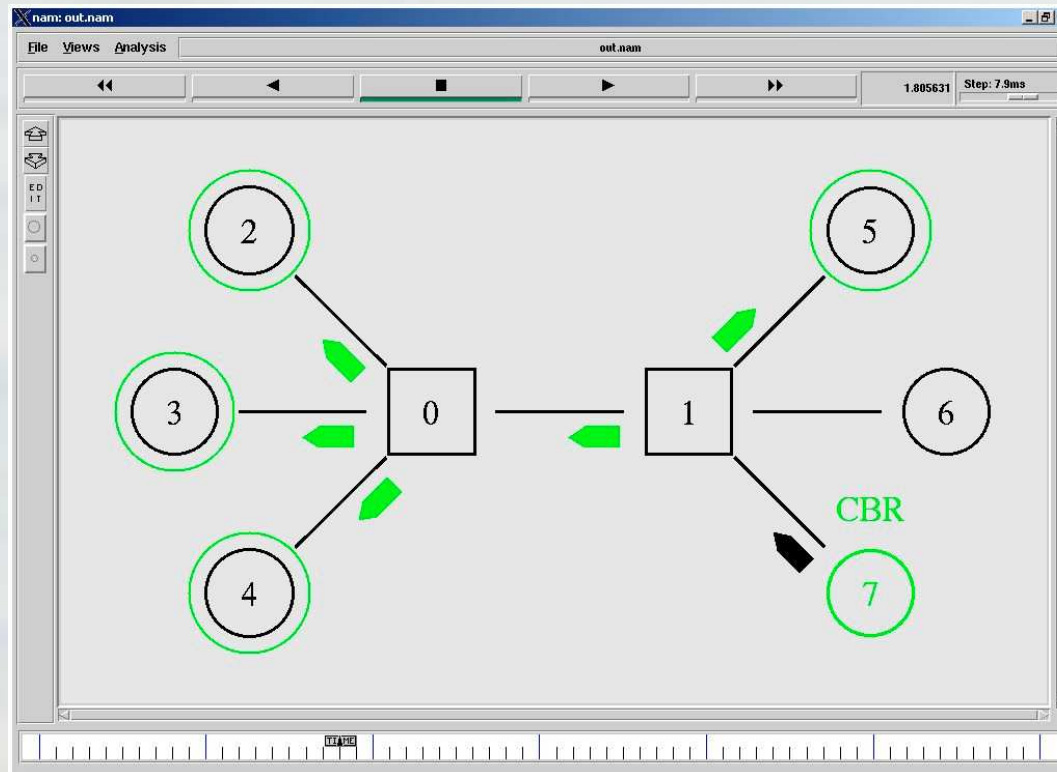
The MAS Test Report (MTR) will record the output provided by the MAS in a delivered structure which takes into account all the constraints imposed by the communication problem to the multicast algorithm.

The MAS simulator shall provide statistically assessed set results from the user population profiles, as identified by the market analysis

NAM graphical user interface



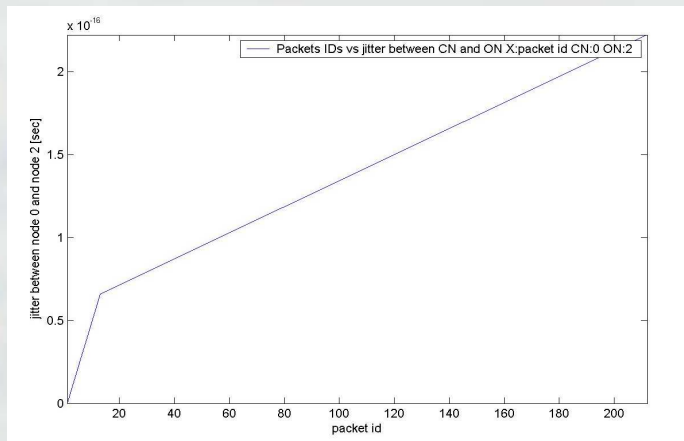
MAS simple test case NAM output



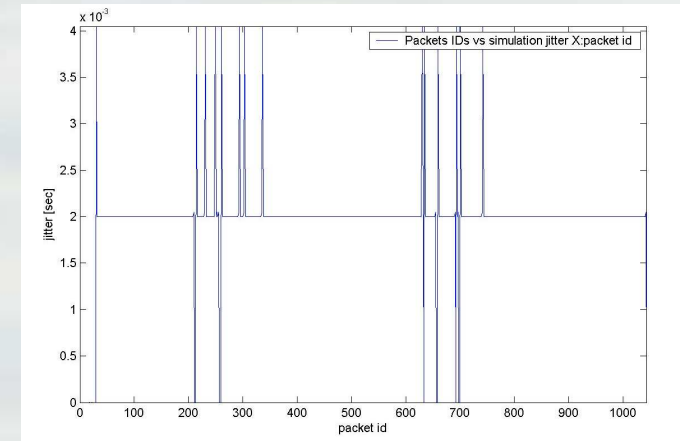
MAS test case output statistic

| Simulation information: | | Simulation End2End delays in seconds: | |
|-------------------------------|----------------------|---|--------------------|
| Simulation length in seconds: | 5.95891 | Minimal delay (CN,ON,PID): | 0.015032 (4,0,633) |
| Number of nodes: | 8 | Maximal delay (CN,ON,PID): | 0.01908 (7,1,653) |
| Number of sending nodes: | 8 | Average delay: | 0.017743783 |
| Number of receiving nodes: | 8 | Delays between current and other node in seconds: | |
| Number of generated packets: | 553 | Minimal delay (PID): | 0.015032 (657) |
| Number of sent packets: | 553 | Maximal delay (PID): | 0.015032 (1) |
| Number of forwarded packets: | 1653 | Average delay: | 0.015032 |
| Number of dropped packets: | 0 | Simulation processing times at intermediate nodes in seconds: | |
| Number of lost packets: | 0 | Minimal (node,PID): | 0 (-1,-1) |
| Minimal packet size: | 8 | Maximal (node,PID): | 0 (-1,-1) |
| Maximal packet size: | 1020 | Average: | 0 |
| Average packet size: | 734.0562 | Processing times at current node in seconds: | |
| Number of sent bytes: | 379328 | Minimal (PID): | 0 (31) |
| Number of forwarded bytes: | 1240000 | Maximal (PID): | 0.002 (642) |
| Number of dropped bytes: | 0 | Average: | 0.001 |
| Packets dropping nodes: | <input type="text"/> | | |
| Current node information: | | | |
| Number of generated packets: | 4 | | |
| Number of sent packets: | 4 | | |
| Number of forwarded packets: | 496 | | |
| Number of received packets: | 6 | | |
| Number of dropped packets: | 0 | | |
| Number of lost packets: | 0 | | |
| Number of sent bytes: | 32 | | |
| Number of forwarded bytes: | 369032 | | |
| Number of received bytes: | 48 | | |
| Number of dropped bytes: | 0 | | |
| Minimal packet size: | 8 | | |
| Maximal packet size: | 1000 | | |
| Average packet size: | 735.2191 | | |

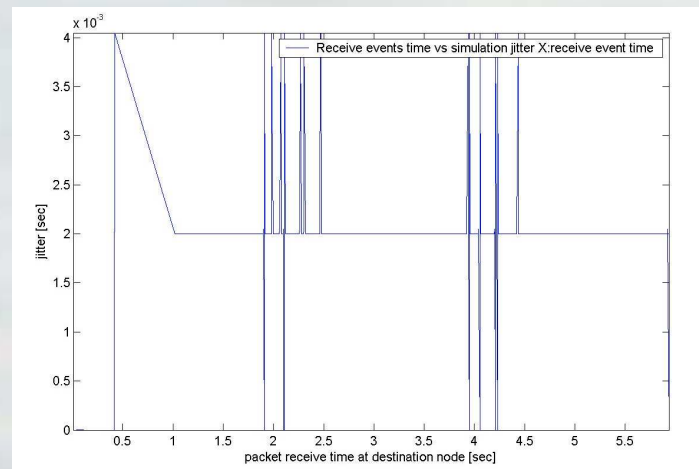
MAS test case output graphics



Inter-node jitter statistics



Packet jitter



Packet receive time jitter statistics



Thank You !!!