# Latency for EARTH

| refresh, [s] | Unicast Call Load (ucl) % | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 10 | | | 20 [50] | | |
| | mcl, % | | | mcl, % | | | mcl, % | | |
| | 1 | 10 | 20 | 1 | 10 | 20 | 1 | 10 | 20 |
| 1 | 0.46/ 0.45 | | 0.36/ 0.36/ | | 0.38/0.38/0.38 | | 0.81/0.82/ 0.58 | | 0.6 |
| 10 | | 1.69/168/ 1.66 | 4.03 | 2.27/ 1.67 | 2.86/2.84/2.82 | 4.03/ 4.05 | | 9.30/4.1 | |
| 50 | 2.0/2.47 | | 14 | | 13.21/13.0 | | 30/30 | 19.09 | 24/ 24.64 |

**Details: ftp://www.fokus.gmd.de/pub/step/papers/Smir9611:Rout.ps.gz**

**e-mail: smirnow@fokus.gmd.de · http: //www.fokus.gmd.de/step/**

## Future Research:

1. IP multicast address <-> ATM group address;
2. Multiple EARTH servers: anycast + query forwarding to the EARTH_holder for the group.

# Latency for CLS (above) and MARS (below)

| refresh [s] | Unicast Call Load (ucl) % | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 10 | | | 20 [50] | | |
| | mcl, % | | | mcl, % | | | mcl, % | | |
| | 1 | 10 | 20 | 1 | 10 | 20 | 1 | 10 | 20 |
| **CLS** | | | | | | | | | |
| 1 | 0.09/4.46 | | 104/473 | | 28/223/446 | | 293/295/479 | | 267 |
| 10 | | 0.13/218/441 | 199 | 0.12/441 | 34/224/443 | 199/476 | | 338/280 | |
| 50 | 0.09/4.14 | | 98.77 | | 28.41/230 | | 289/292 | 456 | 264/481 |
| **MARS** | | | | | | | | | |
| 1 | **0.04/4.12** | | **0.04**/470 | | **0.04**/215/443 | | **0.06/3.62**/470 | | **0.05** |
| 10 | | **0.04**/219/442 | **0.04** | **0.04**/440 | **0.04**/217/443 | **0.04**/470 | | **0.08**/223 | |
| 50 | **0.04/3.82** | | **0.04** | | **0.04**/221 | | **0.06/5.66** | 444 | **0.05**/472 |

**NOTE: Each cell of the table has up to 3 numbers: latency for 1 /10 / 50 receivers**

# Some Scalability Analysis

| Name for scheme | Address Resolution | | Multicast | |
|---|---|---|---|---|
| | How | Interface | How | Interface |
| CLS | by Connectionless Server (CLS) in Switch Control Processor (SCP) | fa0 | Cells duplication by switch hardware; point-to-multipoint connections | fa0 |
| MARS | By extended *Classical IP over ATM* server | qaa0 | Cells duplication in host, or MCS, mesh of point-to-[multi]point connections | qaa0 |
| **EARTH** | **by EARTH server in multicast LIS** | **qaa2** | **Cells duplication by switch' hardware; point-to-multipoint connection** | **fa0** |

**Simulation: ASSUMPTIONS: SCP (C) is shared between multicast (MCL), unicast (UCL) and ARP(ACL) call loads; C= 100 calls/sec; 100 000 - 800 000 calls per run; NO losses of calls - instead huge queues;**
**EXPERIMENT: symmetrical factor plan for 3 schemes x 4 factors;**
**OUTPUT: Latency = ARP_dealy + Connection_Establishment_Delay**



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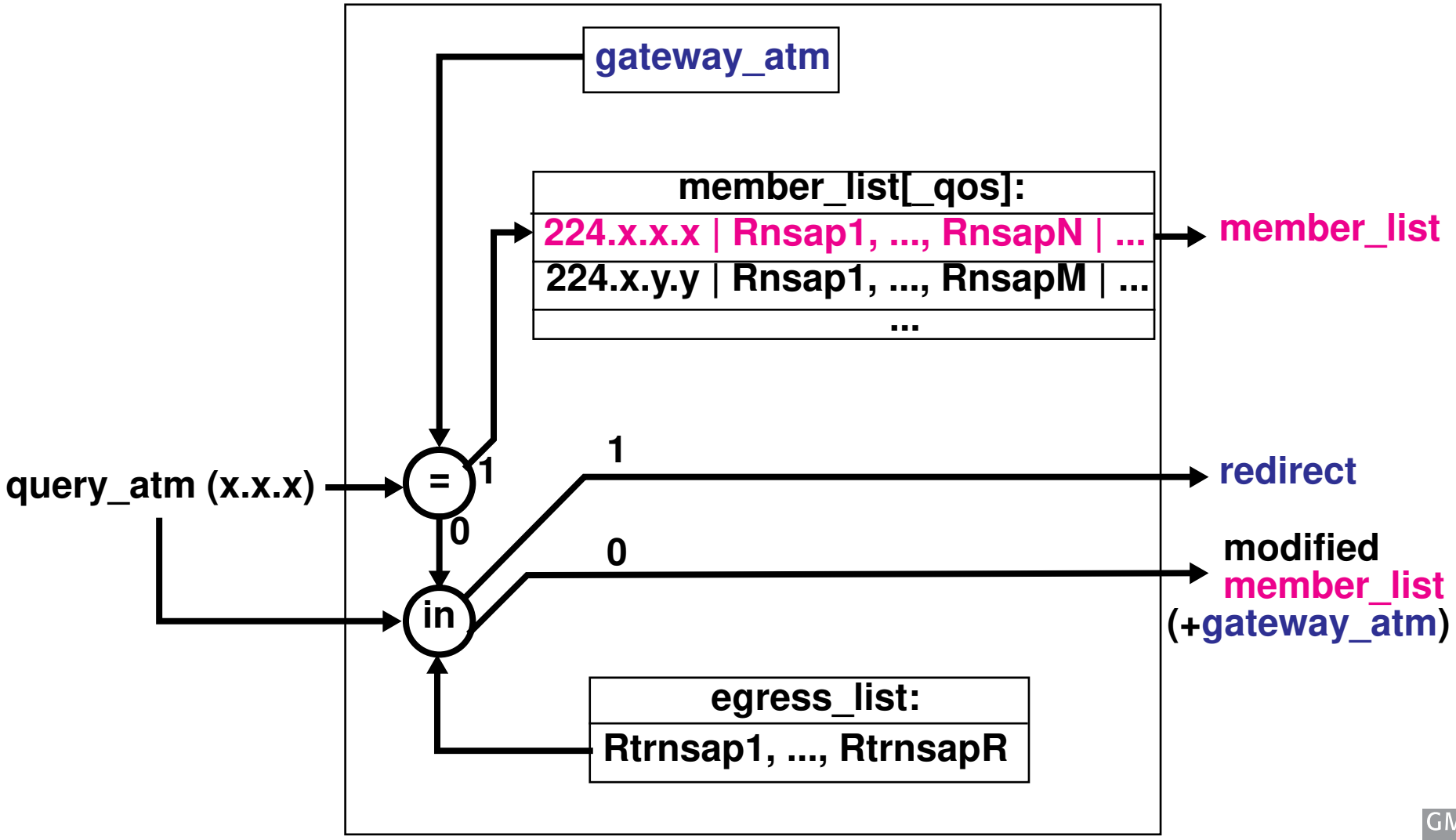
# How it works


gateway_atm
member_list[_qos]:
224.x.x.x | Rnsap1, ..., RnsapN | ...
224.x.y.y | Rnsap1, ..., RnsapM | ...
...
member_list
query_atm (x.x.x)
=
1
0
1
redirect
0
modified
member_list
(+gateway_atm)
in
egress_list:
Rtrnsap1, ..., RtrnsapR

# Single Gateway

- the first crossing (Mrouter) of the metric boundary [IP/ATM] defines the Mrouter as a single gateway (to and from ATM) to the rest of the session;

- The Gateway is dynamic ~ f(time, group, 1st sender);

- Logically: N0_of_sessions = No_of_gateways;

- The Gateway is a Mrouter:
  - designated for a Classical LIS (1st sender is internal), or
  - defined by IDMR protocols (1st sender is external).



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# QoS support

**ATM: One PtM connection = one QoS for all**

**EARTH provides [optionally]:**

- **classified membership information (member_list_qos);**
- **QoS levels should be negotiated in advance all over ATM cloud (or using RSVP over ATM);**
- **separate PtM for each QoS.**



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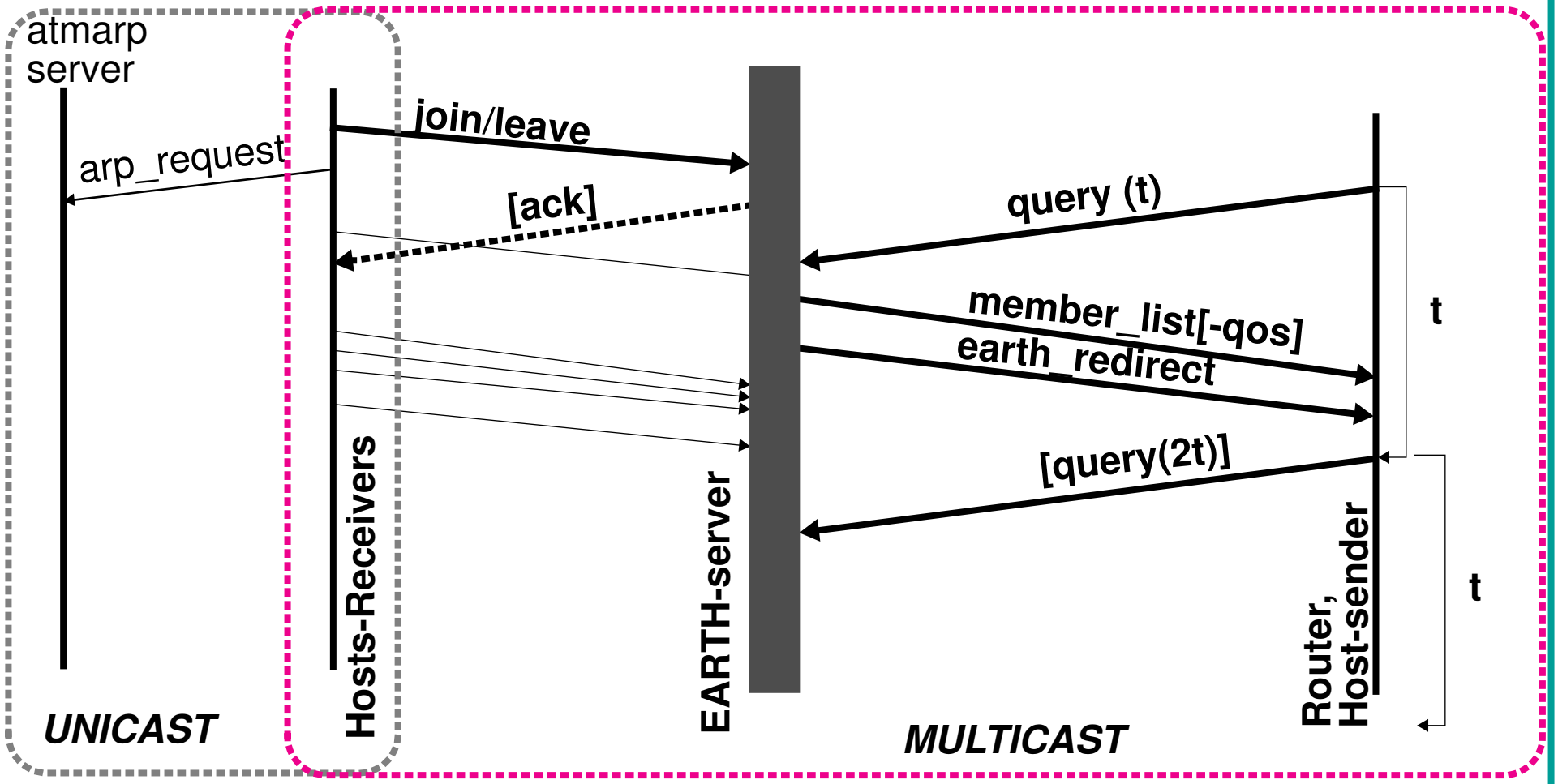
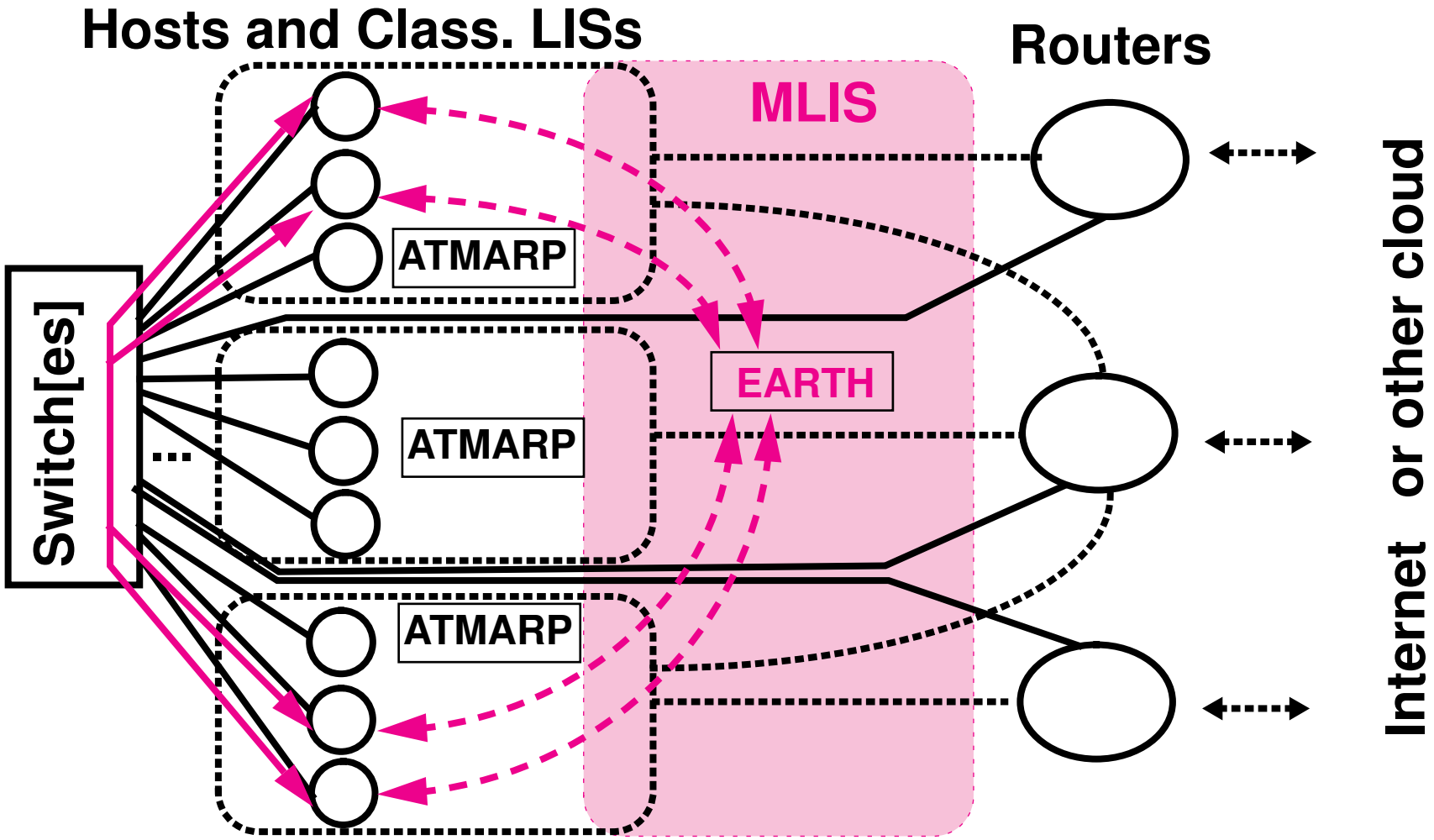
# Behaviour


atmarp
server
arp_request
join/leave
[ack]
query (t)
member_list[-qos]
earth_redirect
t
[query(2t)]
t
Hosts-Receivers
EARTH-server
Router,
Host-sender
UNICAST
MULTICAST

# Multicast LIS



# Scope

ATM cloud is a

· private ATM network with

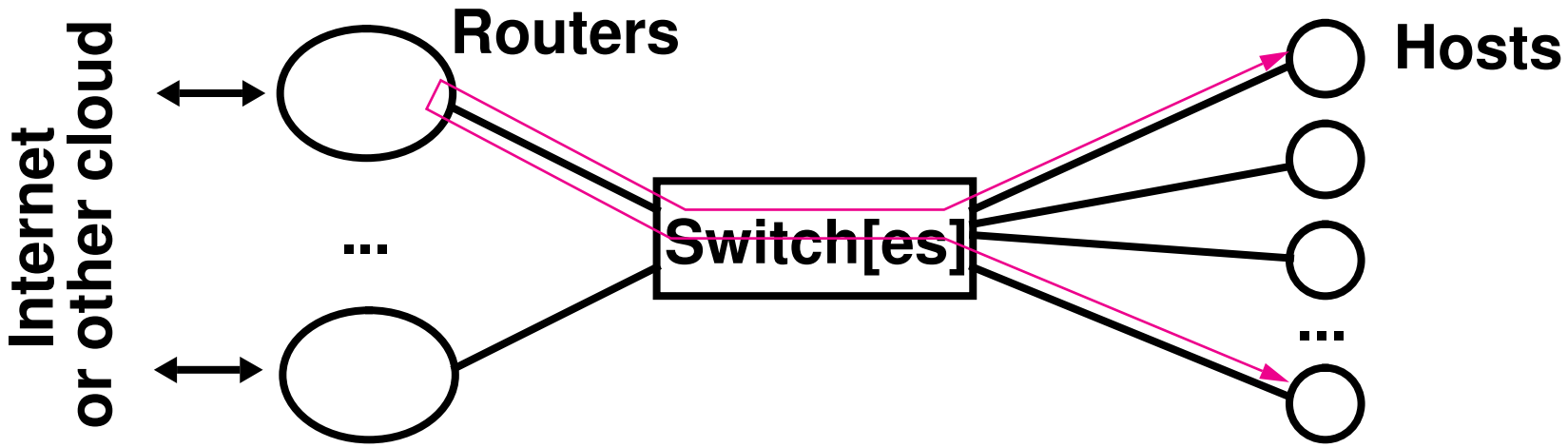
· · uniform signalling;

· · uniform management;

· · arbitrary number of Classical LISs [conforming RFC 1577];

· · endpoints - hosts with both IP and ATM addresses;

· · [a set of] egress router[s] being ATM endpoints.



# Between MARS and VENUS

- MARS - ARP in a single Classical LIS:
  - unicast and multicast;
  - hard state ==> ServCntrVC; ClustCtrlVC.

- VENUS - MARS operation over several Classical LISs:
  - coordination of MARSs is needed;
  - inter-LISs communication is over IP routers.

- EARTH - separation of IP unicast from IP Multicast AR to ATM and:
  - cut-through multiple LISs of the same ATM cloud;
  - protection of IDMR protocols;
  - [limited] support for QoS.



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# The Outline

- Between MARS and VENUS
- Scope
- Multicast LIS
- EARTH server and clients behaviour
- QoS support
- Single Gateway (IDMR protection)
- How it works
- Some Scalability Analysis (Why it's better)



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# *EA*sy IP Multicast *R*outing *TH*rough ATM Clouds (EARTH)

## <draft-smirnov-ion-earth>

**Michael Smirnov (smirnow@fokus.gmd.de)**
**HTTP: //www.fokus.gmd.de/step/**
**GMD FOKUS, Berlin, Germany**

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