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For the REMOT collaboration.

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- REMOT project
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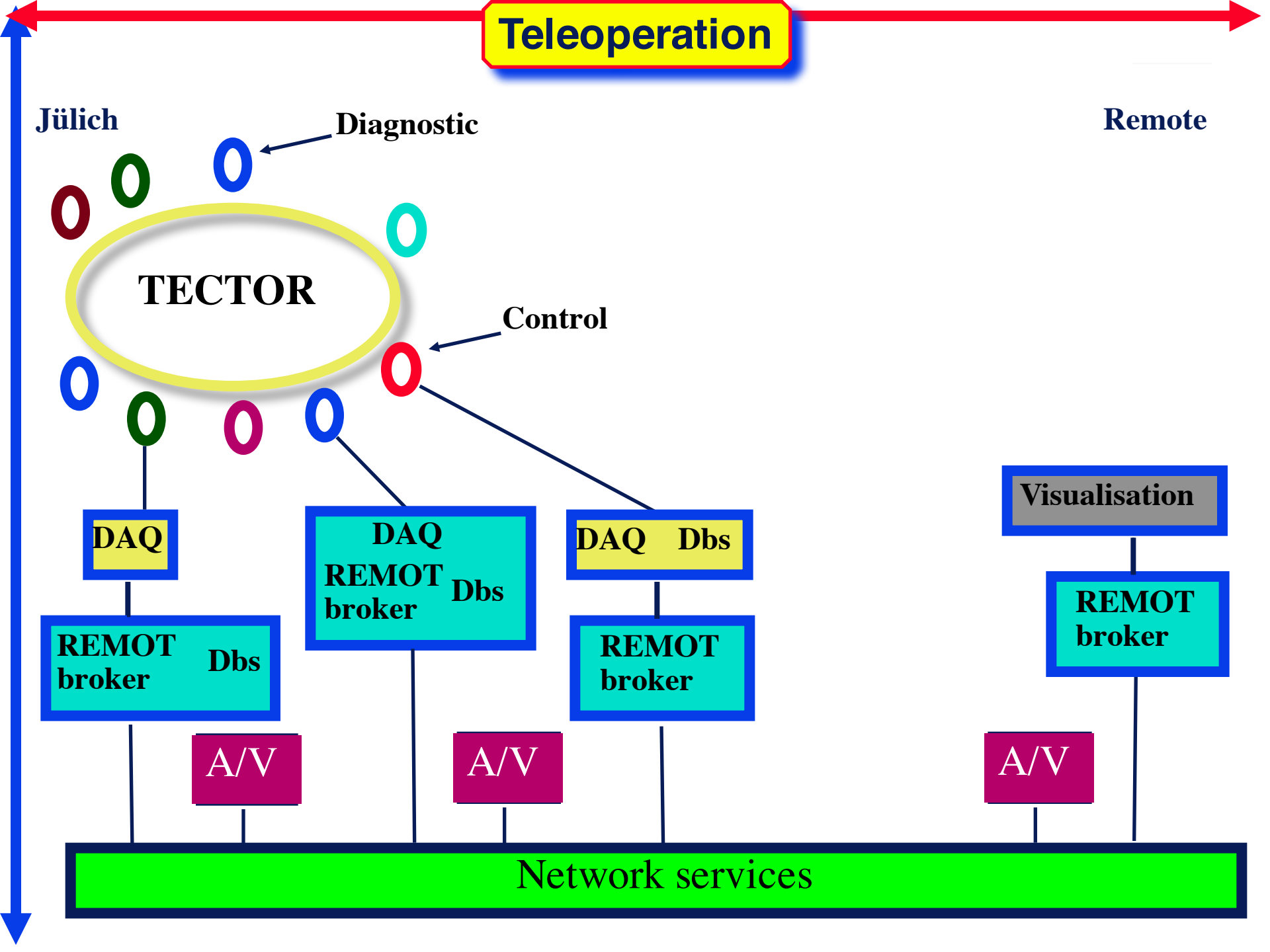
- **REMOT**
  - Remote Experiment MOnitoring and conTrol (RE1008)
  - The REMOT project objective is to develop a system architecture to allow remote control of scientific experiments and facilities that require real time operation and multimedia information feedback, and using available or deploying communications infrastructure.
- **DYNACORE**
  - DYNAmically COnfigurable Remot Experiment
  - The DYNACORE monitoring & control application will allow scientists to access remote experimental facilities in order to perform scientific experiments in a similar way as if they were physically located at those facilities.

Services and Requirements

- **Experiment cycle**
  - load settings in the diagnostics
  - negociations with TEC operator on properties of next pulse
  - freeze all diagnostic and machine parameter
  - load capacitors
  - PLASMA pulse
  - data readout
  - look at data of your own diagnostic
  - correlate with data of other diagnostics
  - draw conclusions for settings on next pulse
- **Cycle takes about 5 - 10 minutes**
- **Load capacitors, pulse, data readout take 3 minutes**
- **Data size: 10 - 100 MByte / pulse depending on active diagnostics**


Teleoperation
Jülich
Diagnostic
Remote
TECTOR
Control
DAQ
DAQ
REMOT
broker
Dbs
DAQ
Dbs
Visualisation
REMOT
broker
REMOT
broker
Dbs
REMOT
broker
A/V
A/V
A/V
Network services

Network requirements

- **Real Time**
  - time is limited between shots and decisions have to be made
- **Scalable**
  - there are about 20 diagnostics from several institutes
- **Multicast**
  - there are many one to one, one to many and many to many conferences going on

- **Solutions**
  - ATM (ip over ATM)
  - ISDN
  - IpV6, RSVP
  - MBone

Pilots

- TF-Ten
- JAMES
- SURFnet4
  - ATM - LANE for DAQ systems
  - ATM - SVC in backbone
  - ATM - tunneling between Utrecht and Geneva
  - Videoconference survey
  - Groupware survey
  - ATM multicast in the backbone
  - ATM - ABR traffic, policing and management
  - IAS

daq architecture

Used

VME VxWork

VME VxWor

VME VxWork

VME VxWork

VME orks

VME VxWorks

ethernet
10 Mbit

Ethernet to ATM bridge/switch
Lan Emulation client

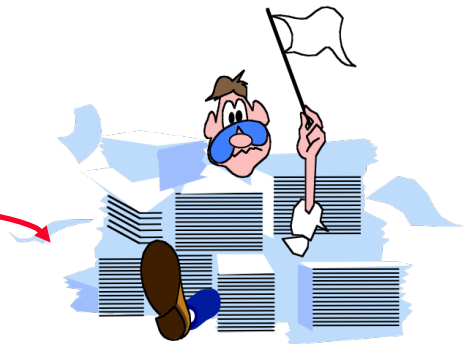
Lan

ATM switch-Lan Emulation server

155 Mbit ATM

Lan Emulation client
HOST= {DEC Alpha,Sun,Hp}
UMAC->{OSF,UNIX}

DLT



User and System load

User and system load in instructions per byte for the data transmitting and data receiving computers. The transmitting computers rate 142 MIPS (V2.1), the receiving computers rate 459 MIPS.

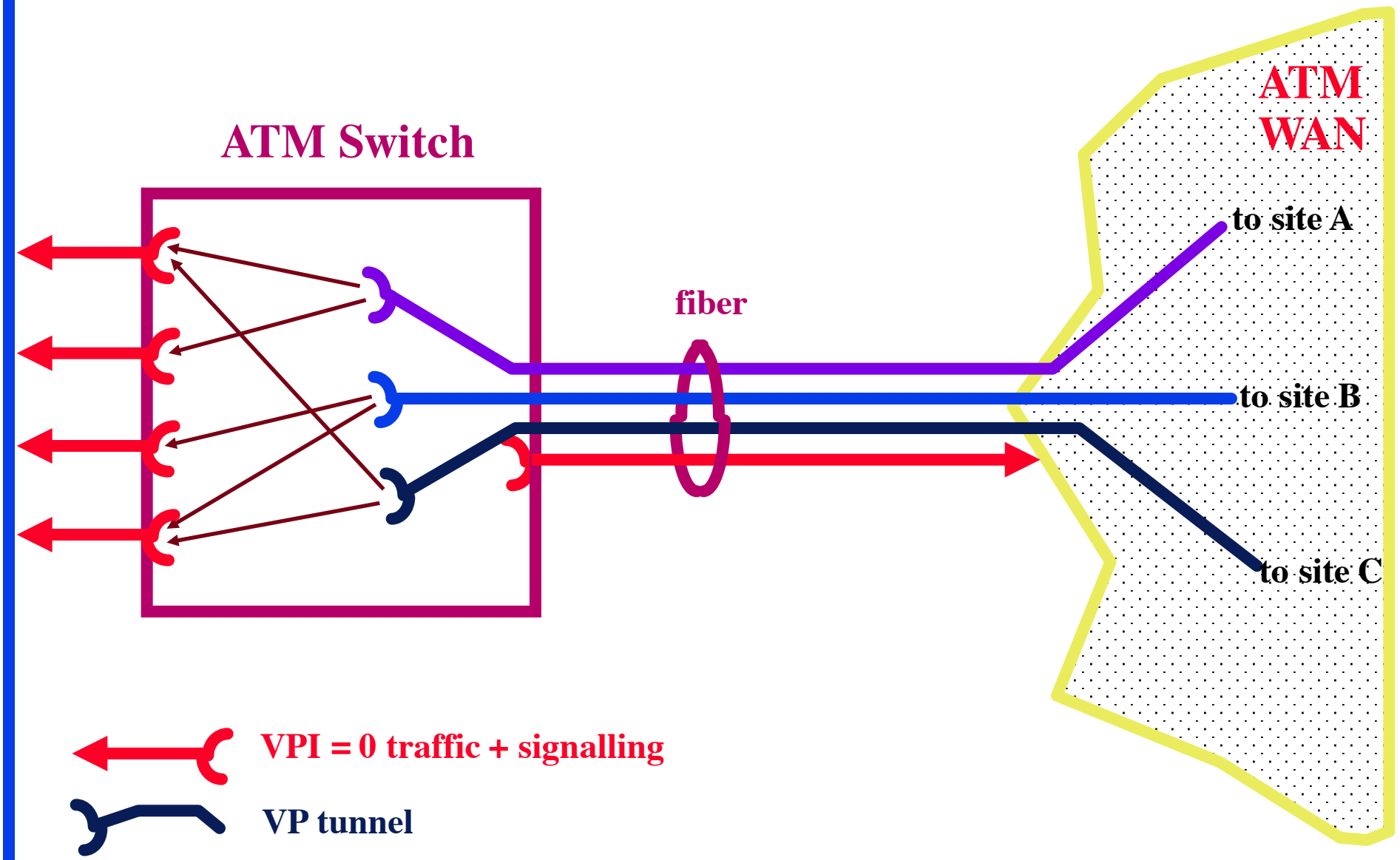
$$i = \#MIPS * load / datarate$$

transmit protocol	MTU	Rate MByt/s	user %	sys %	user i/Byt	sys i/Byt
Ethernet	1516	0.47	1.7	6.6	5.1	20
LAN Emulation	1516	4.4	13	87	4.3	28
LAN Emulation	9234	8.2	27	73	4.6	13
Classical IP on ATM	9200	8.1	24	63	4.3	11

receive protocol	MTU	Rate MByt/s	user %	sys %	user i/Byt	sys i/Byt
Ethernet	1516	0.94	0.8	5.6	3.9	27
LAN Emulation	1516	8.7	6.5	60	3.4	23
LAN Emulation	9234	16.4	6.3	43	1.8	12
Classical IP on ATM	9200	16.2	6.1	42	1.7	12

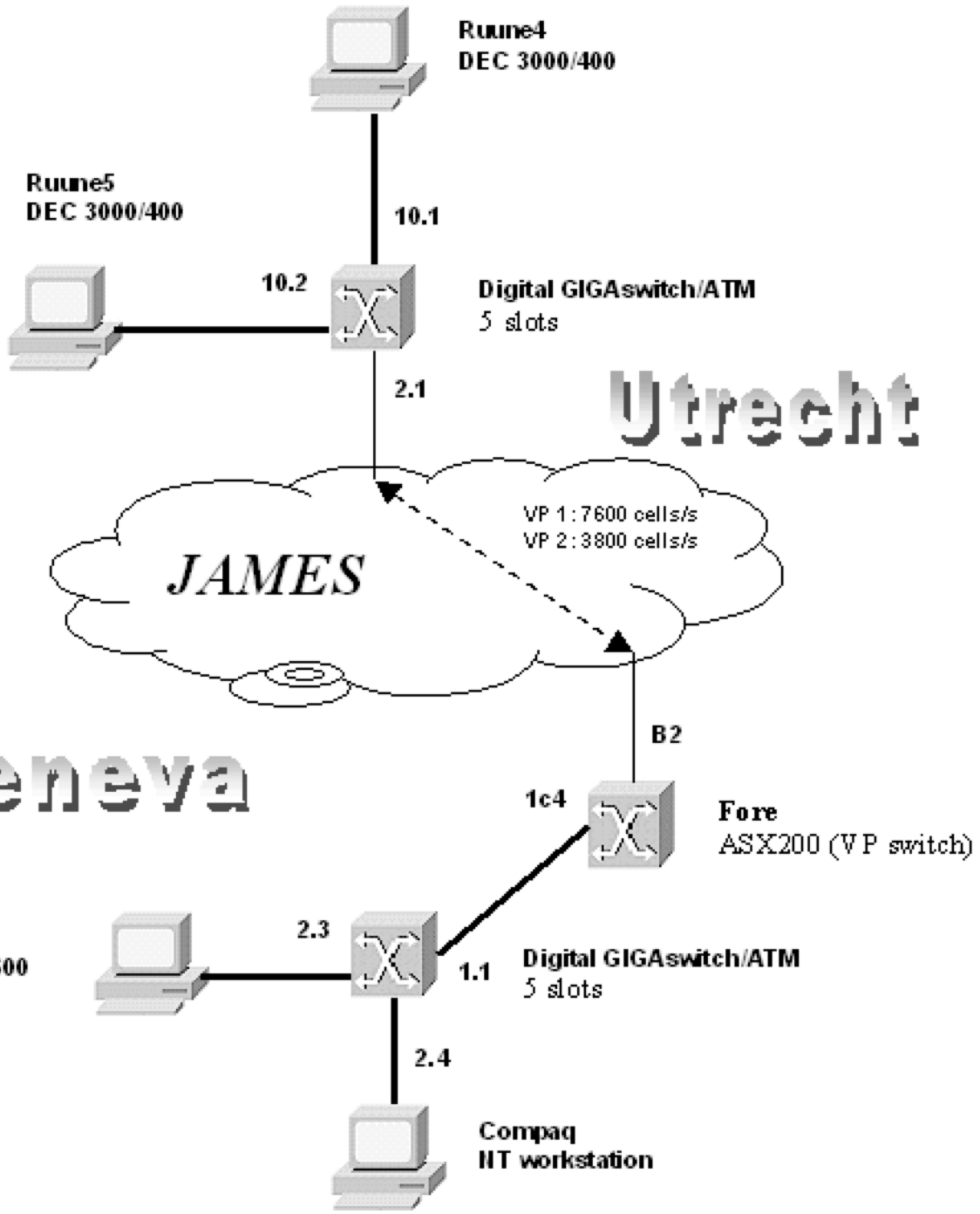
"Experiences with the Application of LAN Emulation in a Data Acquisition System"
C. T. A. M. de Laat, P. G. Kuijer, H. P. Olthuis, V. J. Giesing, and J. Venema,
IEEE TRANSACTIONS ON NUCLEAR SCIENCE [Aug 1997, Vol 44, Nump 04, p. 1635]

SVC tunnel principle

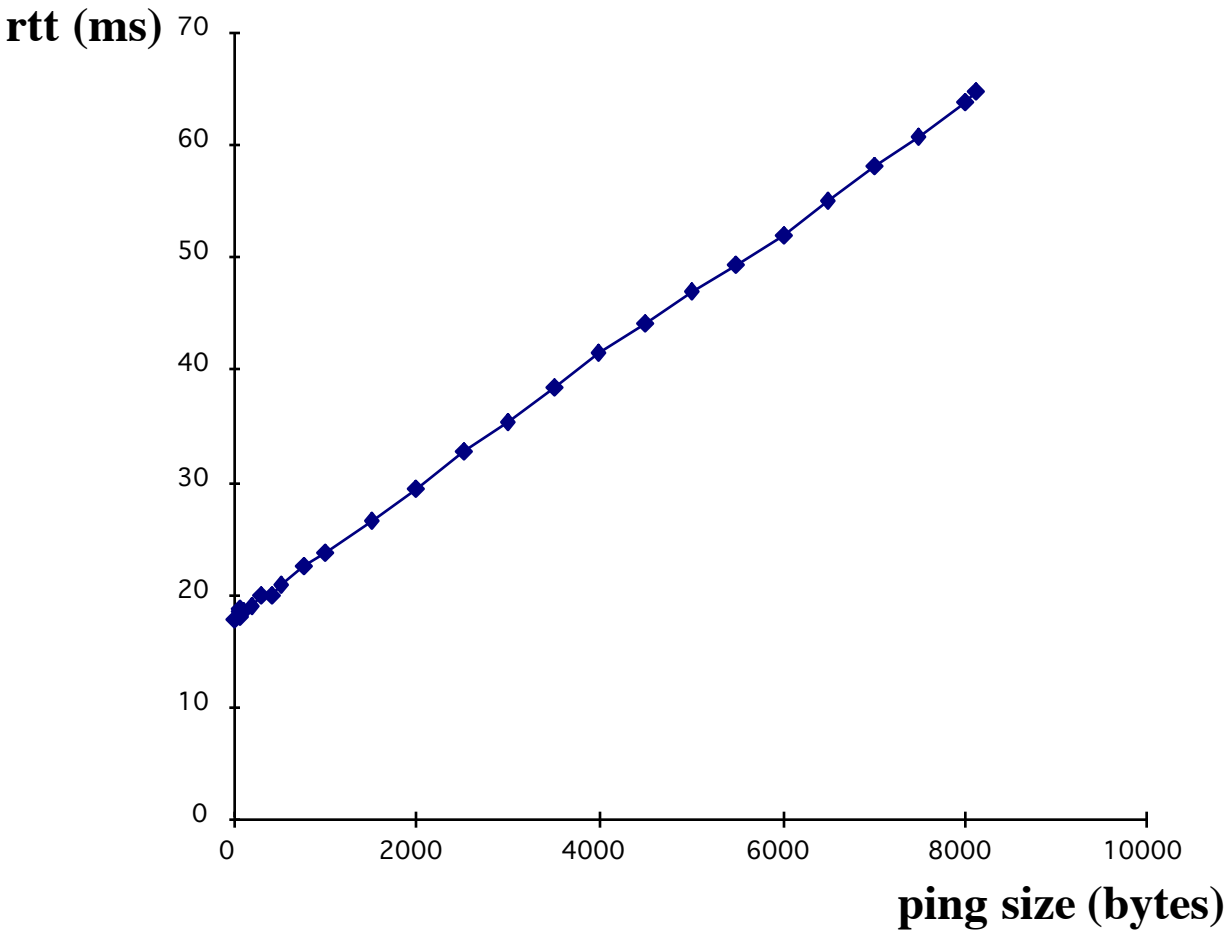


ATM tunnel Setup

A600-unige
AlphaStation 600



round trip times



rtt = size * 5.746069E-03 + 17.7768 -->
bw = 2 * 8 / (5.746069E-03 * 1.0E-03) = 2.78 Mbit/s

Discussion

- Traffic contracts

  <-- FYS - ACCU - SURFnet - JAMES - DFN - FZJ - IPP -->
- shaping - policing
- local flow control versus end to end
- requirements for edge switches ?
  - 1) UNI 3.1 support, migration to 4.0 support
  - 2) UBR, CBR, VBR en ABR support (ABR with flow control/UNI 4.0)
  - 3) EPD and PPD
  - 4) PNNI (IISP)
  - 5) VC switching
  - 6) VP switching
  - 7) VP tunneling support
  - 8) Shaping on VP and VC (also in VP)
  - 9) LANE support (?)
  - 10) Accounting (?)

Conclusions

- ATM is only option in the future
- use IP over the normal internet for demonstrators
- Video conferencing on MBone, later on specialized hardware such as the AVA/ATV or MESH
- Lot of basic ATM technology still needs to be tested

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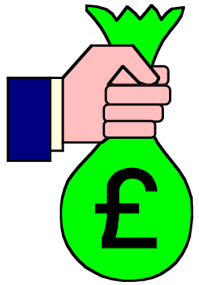

The following persons made significant contributions to the project:

A. Schindler, Peter de Nijs, Victor Reijs, Henk Mos.