C. T. A. M. de Laat

Faculty of Physics and Astronomy Utrecht

For the DYNACORE collaboration.
1 Title, Name
2 Contents
3 The need for QoS
4 Multi Kingdom Problem
5 Networking in the Netherlands
6 The MBS request
7-.. Remarks
..+1 Generic network status
..+2 Conclusion
The need for QoS

- **Collaboratory has soft real-time requirements**
  - Data connections
    » Certain minimum bandwidth, rtt not important
  - Control connections
    » Low bandwidth, low rtt is important, high availability
  - Audio/video
    » Constant bandwidth, rtt, no jitter, multicast

- **Distributed Computing**
  - Message passing
    » Medium bandwidth, low rtt

- **IP-telephony**
  - Voice over IP
    » Low bandwidth, low rtt, low jitter

- **Other requirements**
  - Authentication, Authorisation, Accounting
  - Encryption, security, VPN
Why not ATM

- Complex
  » AAL, ABR, ATM, AvCR, BUS, CAC, CBR, CDV, CLP, CLR, CLR0, CRM, CTD, DSP, DTL, EPD, ES, ESI, GCAC, IAS, ICR, IISP, ILMI, LANE, LEC, LECS, LES, LGN, MIB, NNI, NSAP, PG, PGL, PPD, PTSE, PTSP, PNNI, PVC, PVCC, PVPC, QoS, RCC, SVC, SVCC, UBR, UNI, VBR, VCC, VCI, VP, VPC, VPI, ...

- Did not make it to the desktop
  » Plug and play switched ethernet works

- Speed advantage overtaken by packet networks (Ethernet, POS, POF, DWDM)

- Overhead counts
  » ATM overhead 10%  

- That’s called progress!
• Physics-UU to IPP-FZJ => 7 kingdoms
  – Physics department
  – Compute Center, Campus network
  – SURFnet, NRN-Netherlands
  – Dante - ten 155
  – WINS/DFN, NRN-Germany
  – FZJ-ZAM, Campus network
  – FZJ-IPP, Institute of Plasma Physics
NMI (user entered MacsBug on purpose)
17-Jun-1999 11:51:26 PM (since boot = 28 minutes)
Current application is “Microsoft PowerPoint”
Machine = 312 (PowerBookG3Series), System $0860, sysu = $01008000
ROM version $077D, $41F6, $0002 (ROMBase $FFC00000)
VM is on; paging is currently safe
NIL^ = $FFC10000
Stack space used = -8018882
Address FFC0693A is in the ROM at _PutIcon+0378C

68020 Registers
D0 = 00000000 A0 = FEE00000 USP  = 0B25F3D8
D1 = 0000003C A1 = 0028B9A4 MSP  = 00000000
D2 = 008D49B0 A2 = 00019570 ISP  = 0BA055E4
D3 = 0B25FAF0 A3 = 00000000 VBR  = 0016D494
D4 = 746FFF00 A4 = 0B25F754 CACR = 00000001 SFC = 0
D5 = 0000FFFF A5 = 0B9F3790 CAAR = 00000000 DFC = 0
D6 = 6C204301 A6 = 0B25F42C PC   = FFC0693A
D7 = 00010000 A7 = 0BA055E4 SR   = SmxnzvC Int = 0

Calling chain using A6/R1 links
Back chain  ISA  Caller
0B25F8FF    PPC  002FD83C  EmToNatEndMoveParams+00014
0B25F880    PPC  1B5C67F8
0B25F848    PPC  1B5C68A8
0B25F7D8    PPC  1B249B30
0B25F780    PPC  1B2905DC
0B25F6A0    PPC  1AE7BE98 AfxWaitNextEvent+00050
Overview Network Status IPP-FOM-UU Hosts

- See the [user guide](http://ipp277.ipp.kfa-juelich.de/~blom/net_perf/ipp/Table/net_data.html) for a description of the table below.
- See also the [hosts documentation](http://ipp277.ipp.kfa-juelich.de/~blom/net_perf/ipp/Table/net_data.html).

Select ping value: **min**, **avg**, **max**, **all**, **lost**.

### IPP-FOM-UU Network Status

**Date:** 28/08/1999  
**Time:** 10:00:06

#### Load

<table>
<thead>
<tr>
<th>IPP</th>
<th>ZELAS</th>
<th>ZAM</th>
<th>FOM</th>
<th>SURFnet</th>
<th>UU-AT</th>
<th>UU-36</th>
</tr>
</thead>
<tbody>
<tr>
<td>.397</td>
<td>.167</td>
<td>0.003</td>
<td>3.253</td>
<td>0</td>
<td>4.133</td>
<td>0.02</td>
</tr>
</tbody>
</table>

#### Ping Min [ms]

(row >> column)

<table>
<thead>
<tr>
<th></th>
<th>IPP</th>
<th>ZELAS</th>
<th>ZAM</th>
<th>FOM</th>
<th>SURFnet</th>
<th>UU-AT</th>
<th>UU-36</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPP</td>
<td>0.975</td>
<td>0.975</td>
<td>17.550</td>
<td>16.575</td>
<td>16.575</td>
<td>16.575</td>
<td>16.575</td>
</tr>
<tr>
<td>ZELAS</td>
<td>0.976</td>
<td>0.976</td>
<td>17.560</td>
<td>15.609</td>
<td>16.585</td>
<td>16.619</td>
<td></td>
</tr>
<tr>
<td>ZAM</td>
<td>1.000</td>
<td>1.000</td>
<td>17.000</td>
<td>15.000</td>
<td>16.000</td>
<td>16.000</td>
<td></td>
</tr>
<tr>
<td>SURFnet</td>
<td>16.700</td>
<td>16.200</td>
<td>15.600</td>
<td>1.700</td>
<td>0.800</td>
<td>0.800</td>
<td></td>
</tr>
<tr>
<td>UU-AT</td>
<td>16.640</td>
<td>17.493</td>
<td>16.640</td>
<td>1.666</td>
<td>0.832</td>
<td>0.832</td>
<td></td>
</tr>
<tr>
<td>UU-36</td>
<td>16.700</td>
<td>17.100</td>
<td>16.400</td>
<td>2.100</td>
<td>0.831</td>
<td>0.528</td>
<td></td>
</tr>
</tbody>
</table>
## Throughput [Mbit/s]

(row >> column)

<table>
<thead>
<tr>
<th></th>
<th>IPP</th>
<th>ZELAS</th>
<th>ZAM</th>
<th>FOM</th>
<th>SURFnet</th>
<th>UU-AT</th>
<th>UU-36</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPP</td>
<td></td>
<td>6.35</td>
<td>5.97</td>
<td>.52</td>
<td>2.59</td>
<td>4.06</td>
<td>3.99</td>
</tr>
<tr>
<td>ZELAS</td>
<td>6.09</td>
<td></td>
<td>6.81</td>
<td>.17</td>
<td>2.24</td>
<td>4.99</td>
<td>4.61</td>
</tr>
<tr>
<td>ZAM</td>
<td>6.87</td>
<td>6.53</td>
<td></td>
<td>2.05</td>
<td>1.59</td>
<td>2.15</td>
<td>2.73</td>
</tr>
<tr>
<td>FOM</td>
<td>4.92</td>
<td>5.6</td>
<td>5.69</td>
<td></td>
<td>7.93</td>
<td>6.97</td>
<td>7.49</td>
</tr>
<tr>
<td>SURFnet</td>
<td>2.22</td>
<td>3.32</td>
<td>4.05</td>
<td>3.88</td>
<td></td>
<td>26.44</td>
<td>26.03</td>
</tr>
<tr>
<td>UU-AT</td>
<td>4.22</td>
<td>4.51</td>
<td>7.33</td>
<td>.9</td>
<td>20.81</td>
<td></td>
<td>64.53</td>
</tr>
<tr>
<td>UU-36</td>
<td>4.2</td>
<td>4.1</td>
<td>6.62</td>
<td>4.78</td>
<td>23.8</td>
<td>65.16</td>
<td></td>
</tr>
</tbody>
</table>
In order to support group meetings we asked for 5 Mbit/s each Monday morning 7h30 - 13h00

It did not happen

Why?
At the first MBS meeting DANTE told us that:

- they would be the interface for the users to the NRN and TEN-155 network.
- we have to say which two doorsteps the connection must be made. Thats all. (local loops to non research networks should be taken care to by users)
- they had some form of agreement with the nrn's about amount of bandwidth available for these projects
• filling in the forms was still a little cumbersome, certainly in the beginning of the beta-test and certainly for "real end users without knowledge" but that improved. See also Tiziana's comments.
Organisational: SURFnet wants the user (customer) to come to SURFnet directly and not via a third party. So much for one contact point.
• a strategy problem: ATM is clearly moving out, customers are encouraged to go to IP layer solutions. ATM is "not done", however, in SURFnet for special cases possible.
• Deutsche Telecom can/will only allocate connections with a minimum of one week duration. We requested 5 mbit for every monday morning to start group meeting videoconferences via the network. Even one minute every week means continuous. KPN allocates with resolution of minutes.
Remark 6

• What we already found out in Dynacore a long time ago still applies: DFN regards these kind of connections as extra and orders them as such from DT. DT then calculates the price compared to their services. So we got back from DANTE to contact DFN and ask them for an offer for the costs of the bandwidth. Again so much for one contact point.
Remark 7

Moreover, we had to ask for full time 5 mbit, not for just 5 hours per week due to scheduling resolution ====> price runs into 5 digits at most currencies. Although Juelich is just across the border we had to ask for connectivity to Frankfurt (long distance).
Remark 8

- We had no problems in getting cooperation from the local institutes.
• We never got the MBS service up due to the costs on German side
• It works in the TF-TANT case because the NRN's themselves are the customers. SURFnet made no problem whatsoever there. DFN to Stuttgart??
• Technically it seems to me that MBS adds to fragmentation of installed bandwidth and as such potentially a waste of resources. It can be argued that using UBR links for the regular services and CBR for the MBS allows use of idle capacity by the regular service. However, I do not know, but would not be surprises if lost cells in the ATM core destroy AAL5 packets and have negative influence on the regular service (needs to be investigated?).
• MBS as business case is interesting, since we will probably in some form get similar issues in a future rollout of DiffServ + bandwidth broker + AAA.
• Our current measurements over the normal internet show that we have a typical goodput between Dutch institutes and FZJ-Juelich of about 20-200 kbit/s in daytime and only in the late night it can reach 10 mbit/s. See: http://www.phys.uu.nl/~dynacore/netapplet.html

• We already ruled out the end institutes and the connectivity from Dutch institutes to SURFnet backbone and that backbone itself (see DAS project applet). We are currently investigating together with SURFnet the rest of the traject. Bottom line for Dynacore is: to do collaboratory work an improvement is necessary.
• VPN establishment
• VPN performance
• Usefulness of the service
• Problems encountered
• DANTE's interaction with the beta user,
• National Research Networks' ability to provide the service nationally,
• including any constraints or limitations,
• Interaction with the relevant National Research Networks
• Your MBS experience in general
• Recommendations to DANTE

• never
• none
• Useful
• several
• good
• Oke if..

• Tough
• Good
• Politics
• We are all nice guys but in the end we wanted free high bandwidth -> WAN costs may still be prohibitive for real rollout

• I have no doubt that everybody works at their best and has the best intentions. However, the combination does not (yet) work out for us. Thanks for the efforts up to now.