A Simulation model for e-VLBI traffic on network links in the Netherlands

Julianne Sansa

May 19, 2007

Introduction
- The EVN
- Setup

Related work & Tools
- Related Application models
- Tools used

Single parameter variations
- Packet Intervals
- Receiver limitation
- Competing Internet traffic

our e-VLBI model

Conclusions

The EVN

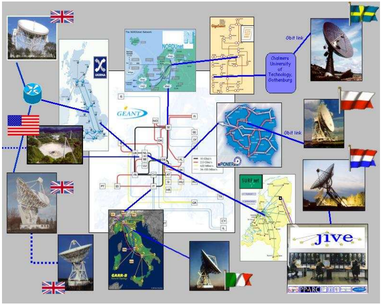

Figure: Institutions within the EVN

Setup

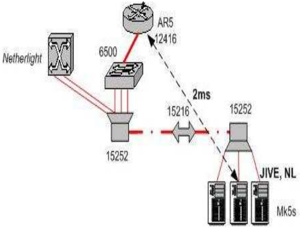

Figure: Network topology for which tests were conducted

- link capacity 1 Gbps
- RTT 10, 20 or 40 ms

Related Application models

1. General TCP/IP wide area traffic model
2. Web Application models
3. FTP and SMTP models

Models provide critical data e.g. connection establishment speed, the sizes and timing of exchanges of request and response data.

Tools used

1. Tracing the raw data:
   1.1 embed instrumentation software in the client
   1.2 install specialised software and hardware in the network
   1.3 install publicly available packet capture tools on off-the-shelf hardware
2. Modeling the data flow e.g. ns-2, Ptolemy, Real Network Simulator, Scalable Self-Organising Simulation (SSFNet), J-Sim and Matlab

We used 1.3 and ns-2 in our investigation.

Packet Intervals

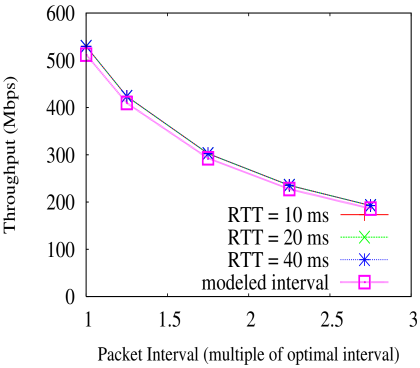

Figure: simulated e-VLBI data flow's packet interval superposed on the model parameters

Receiver limitation

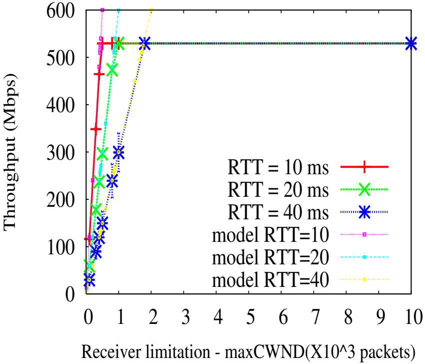

Figure: simulated e-VLBI data flow's receiver limitation superposed on the model parameters

Background traffic

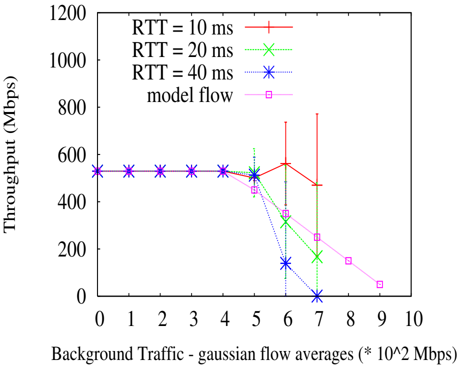

Figure: simulated e-VLBI data flow's background traffic superposed on the model parameters

e-VLBI model

$$interval = packet\ size * 8/e - VLBI\ \ rate \tag{1}$$

$$e - VLBI\ \ throughput = packet\ size * 8/interval \tag{2}$$

$$maxCWND = \frac{e - VLBI\ \ rate * e - VLBI\ \ flow\ \ RTT}{8 * packet\ \ size} \tag{3}$$

$$e - VLBI\ \ throughput = \frac{maxCWND * 8 * packet\ size}{e - VLBI\ \ flow\ \ RTT} \tag{4}$$

$$e-VLBI\ throughput = \begin{cases} e - VLBI\ \ rate & (0.95L_c - BgAvg) > e - VLBI\ \ rate \\ 0.95L_c - BgAvg & (0.95L_c - BgAvg) < e - VLBI\ \ rate \end{cases} \tag{5}$$

where BgAvg is background traffic average and L_c is the link capacity.

Conclusions

- A combination of large packet intervals, inefficient receiver hardware and excessive background traffic may negatively affect the performance of e-VLBI data transfers.
- Future work will include improving this model by combining the effect of the three parameters and particularly investigating pactet intervals as the other two are purely application external as well as designing data traffic models for other e-VLBI transfer modes (involving disk buffering)