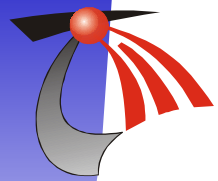

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The Netherlands

Measuring Traffic on the Internet

Aiko Pras

Centre for Telematics and Information Technology (CTIT)
University of Twente (UT)
The Netherlands

http://wwwhome.ctit.utwente.nl/~pras

PRESENTATION AT THE IFIP WG6.7 Workshop and EUNICE Summer School
On Adaptable Networks and Teleservices

TRONDHEIM, 03-09-2002

OVERVIEW

MEASURING TOOLS

MEASURING LIMITS

MEASUREMENT RESULTS

LESSONS TO BE LEARNED

CONCLUSIONS

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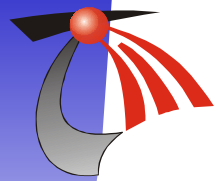
CONCLUSIONS



MEASURING TOOLS

LOCAL SYSTEM

REMOTE (END) SYSTEM

ROUTERS

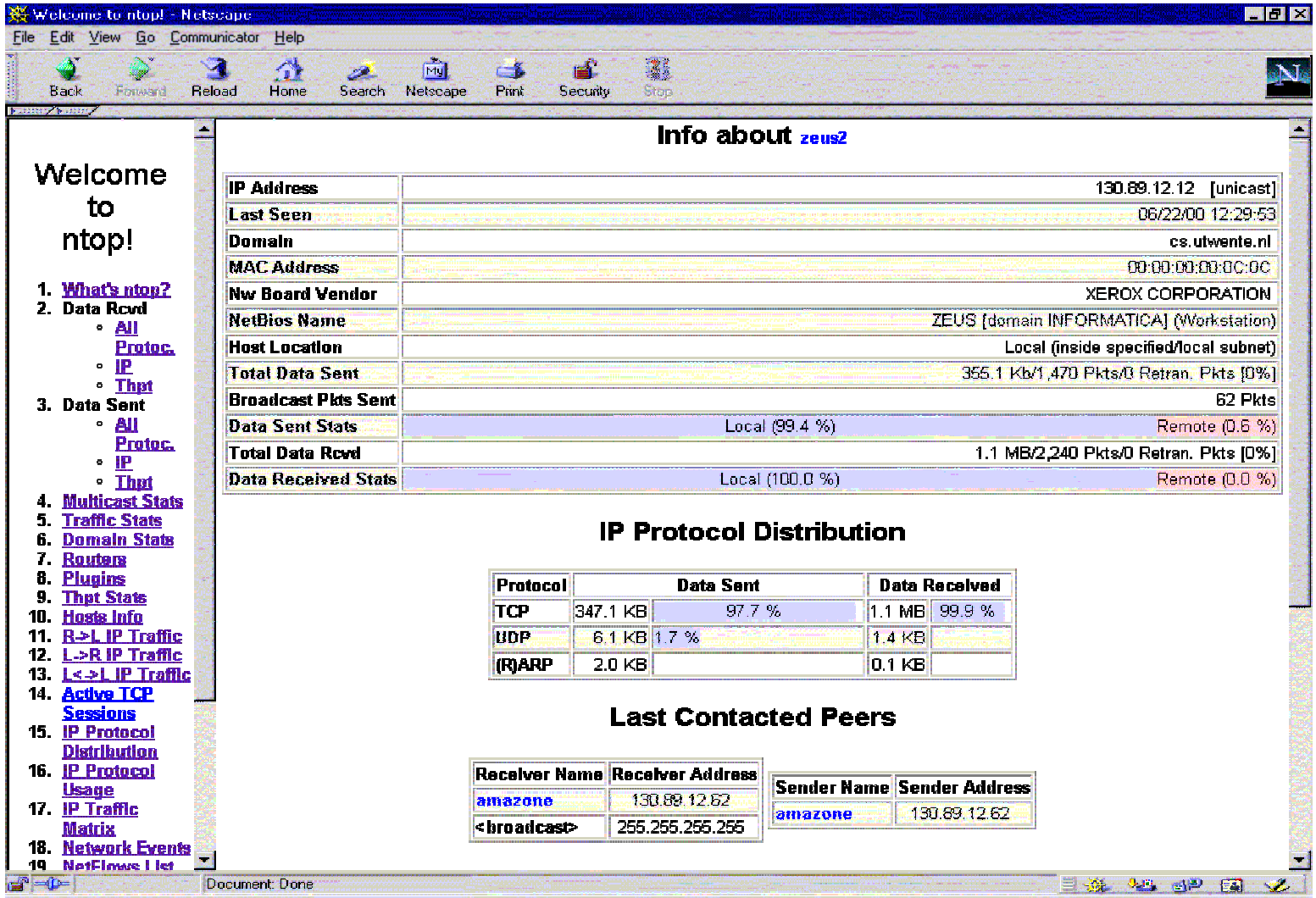
SNIFFERS

MEASURING TOOLS: LOCAL SYSTEM

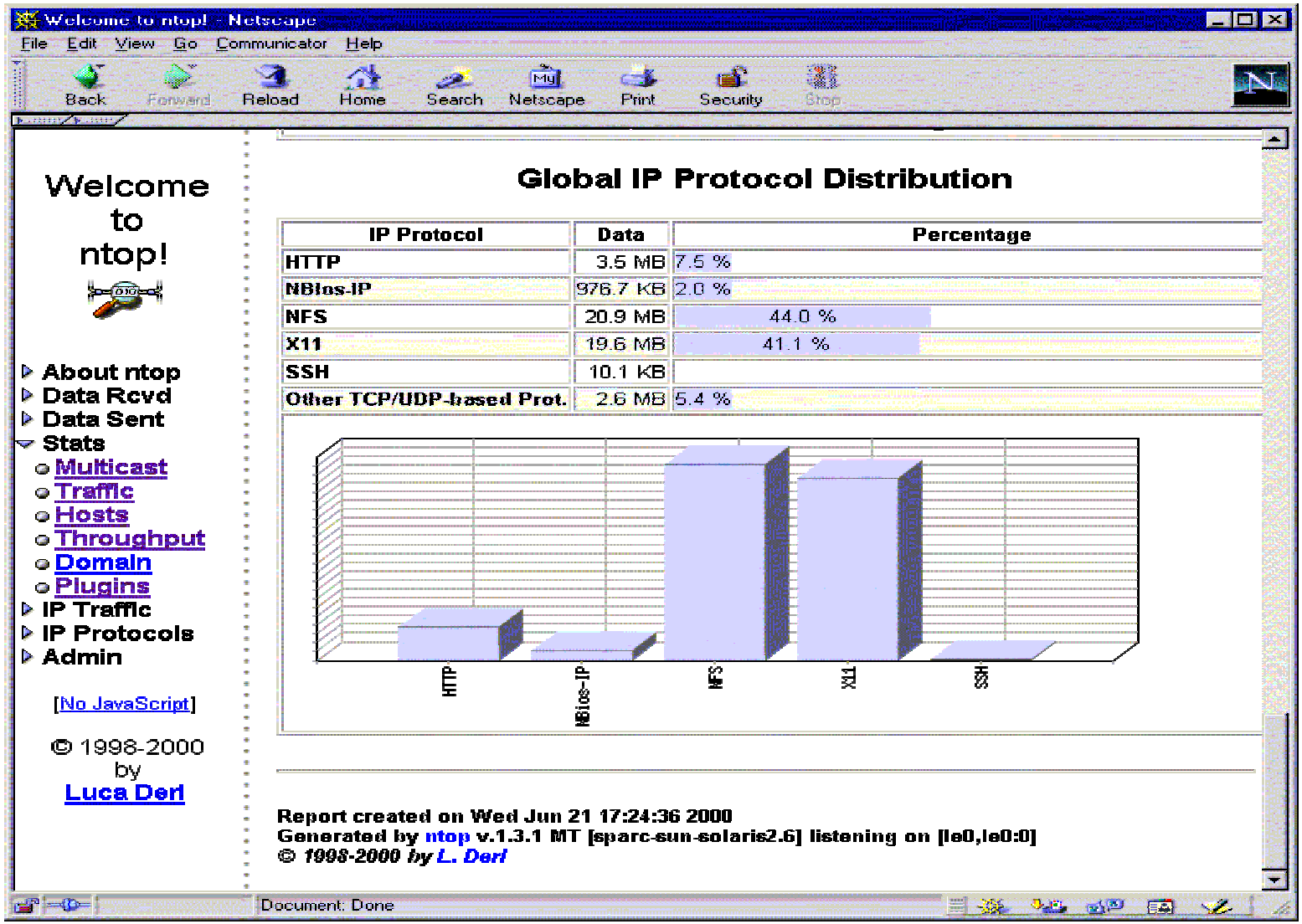
NETSTAT
TCPDUMP
ETHEREAL
NTOP

PROMISCUOUS MODE

MEASURING TOOLS: LOCAL SYSTEM - NTOP



MEASURING TOOLS: LOCAL SYSTEM - NTOP



MEASURING TOOLS: REMOTE (END) SYSTEM

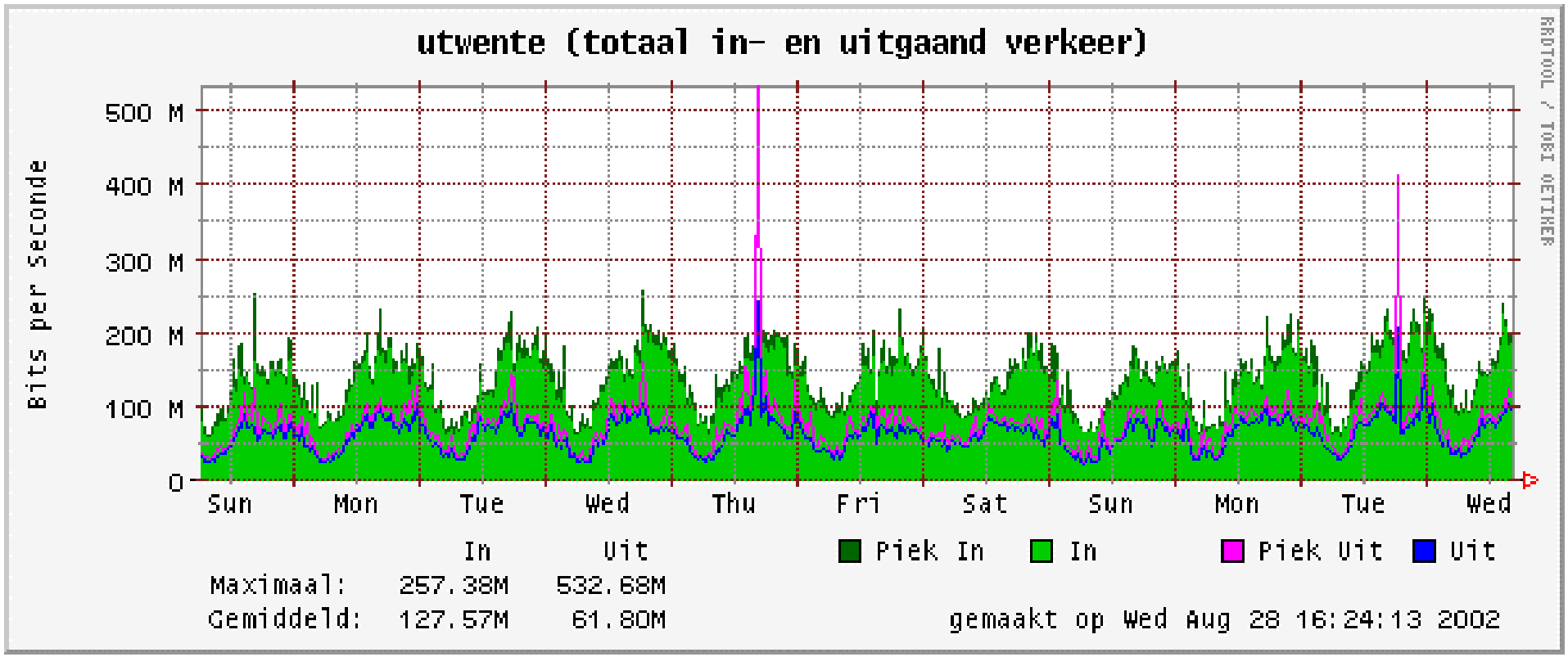
MIBS

IF-MIB

SNMP

MRTG

MIBS - MRTG


utwente (totaal in- en uitgaand verkeer)
Bits per Seconde
500 M
400 M
300 M
200 M
100 M
0
Sun
Mon
Tue
Wed
Thu
Fri
Sat
Sun
Mon
Tue
Wed
In
Uit
Maximaal: 257.38M 532.68M
Gemiddeld: 127.57M 61.80M
Piek In
In
Piek Uit
Uit
gemaakt op Wed Aug 28 16:24:13 2002
MRTOOL / TOBI OETIKER

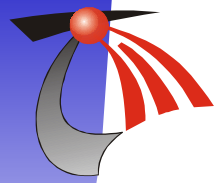
MEASURING TOOLS: ROUTERS

NETFLOW

- CISCO

LFAP

- ENTERASYS (CABLETRON)

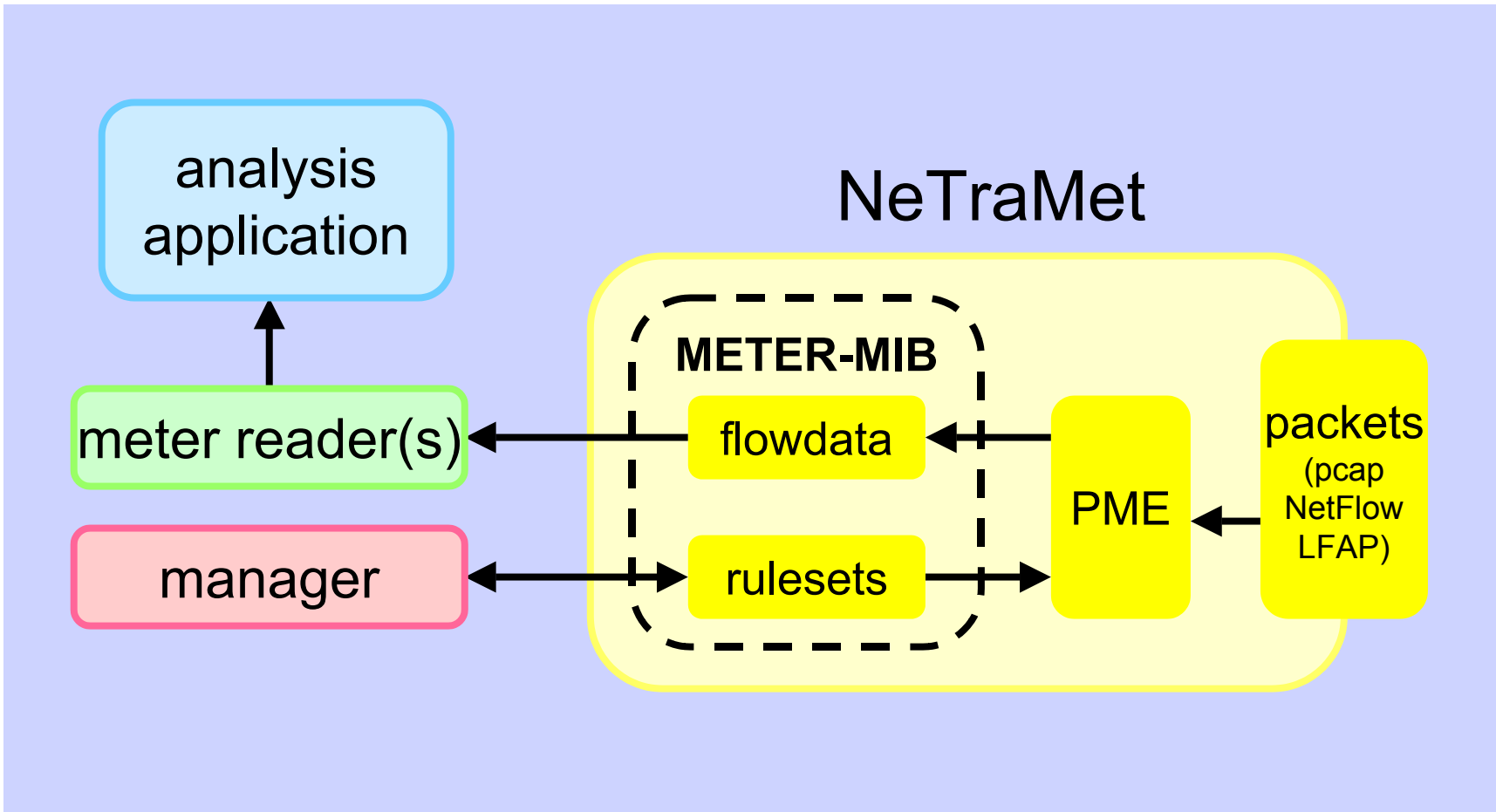


MEASURING TOOLS: SNIFFERS

RMON
RMON2

NETRAMET

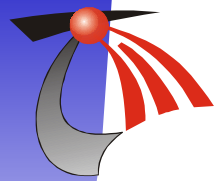
MEASURING TOOLS: SNIFFERS - NETRAMET



MEASURING TOOLS: SNIFFERS - NETRAMET

EXAMPLE OF A RULESET

```
if SourcePeerType == IPv4
{
  if DestPeerAddress == ( 130.89/16 )
  {
    count;
  }
}
```



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MEASURING TOOLS - CONCLUSIONS

MANY TOOLS EXIST

SOME ARE COMMERCIAL

MANY ARE OPEN SOURCE

ISN'T THIS GREAT?

MANAGERS CAN FIND ADEQUATE TOOLS TO MONITOR THEIR NETWORKS

STUDENTS CAN FIND GREAT TOOLS TO MONITOR WHAT TEACHERS DO

I CAN MONITOR WHAT YOU ARE DOING

…

OVERVIEW

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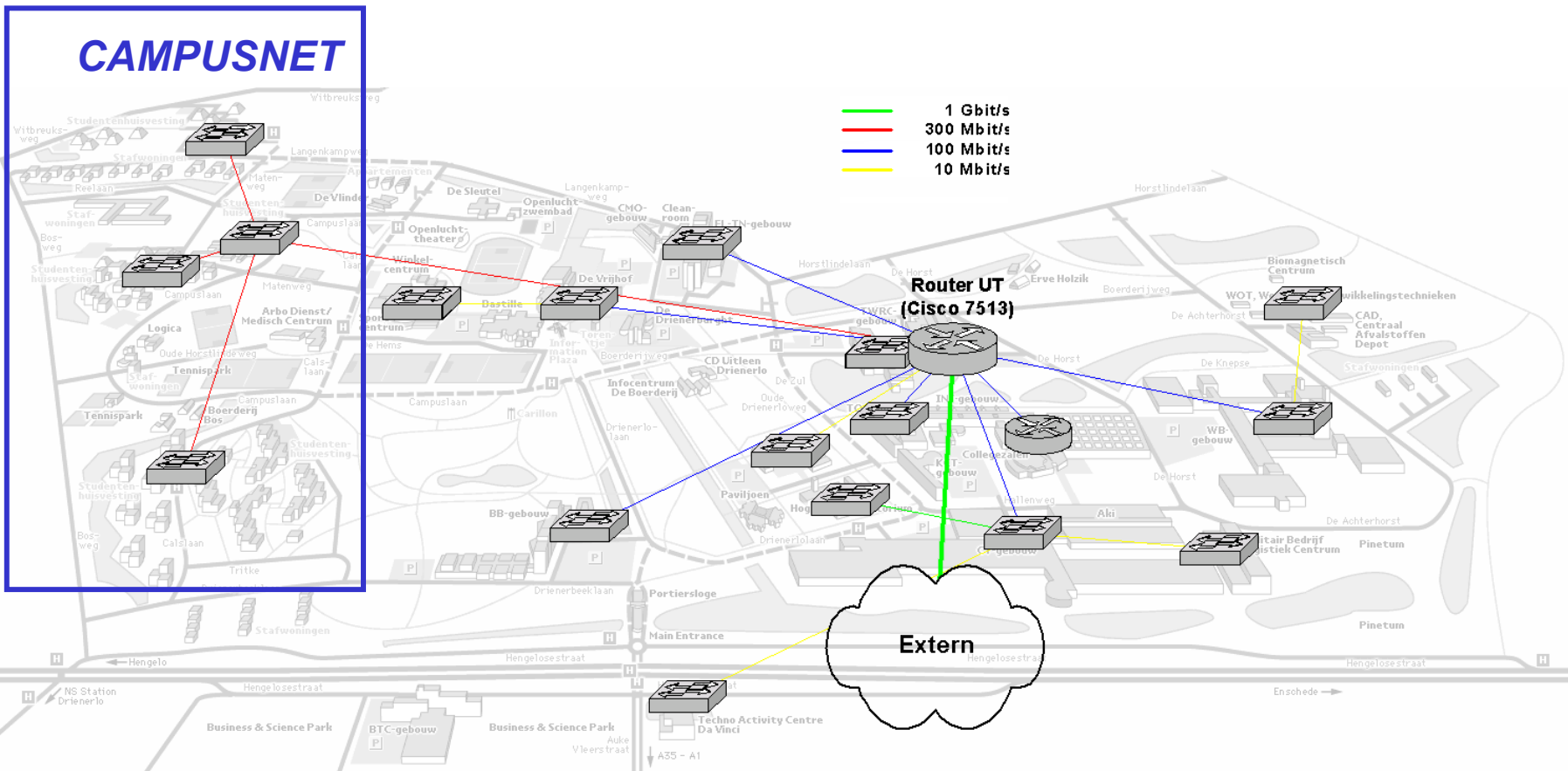
MEASURING LIMITS

WHAT ARE THE LIMITS OF THESE MEASUREMENT TOOLS?
CAN, FOR EXAMPLE, SNIFFERS HANDLE MEGABITS OF TRAFFIC?

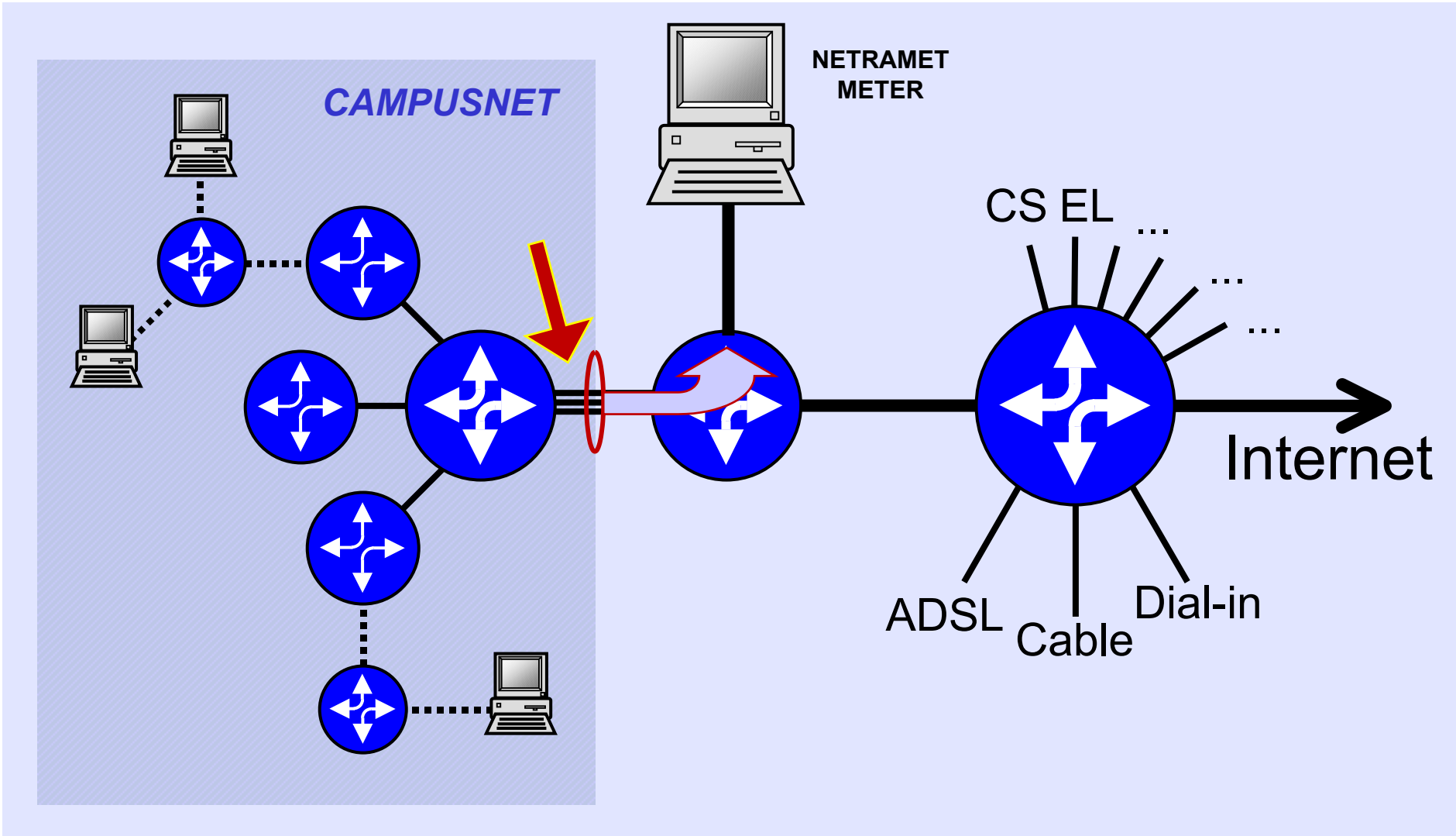
TO DETERMINE THIS, WE HAVE EXPERIMENTED WITH NETRAMET ON OUR CAMPUS-NET

- 2000 USERS
- 100 Mbps ACCESS
- 400 Mbps PEAK

CAMPUS-NET UNIVERSITY OF TWENTE



MEASUREMENT SET-UP



WHAT DID WE MEASURE?

THE TOTAL TRAFFIC ON THE LINK

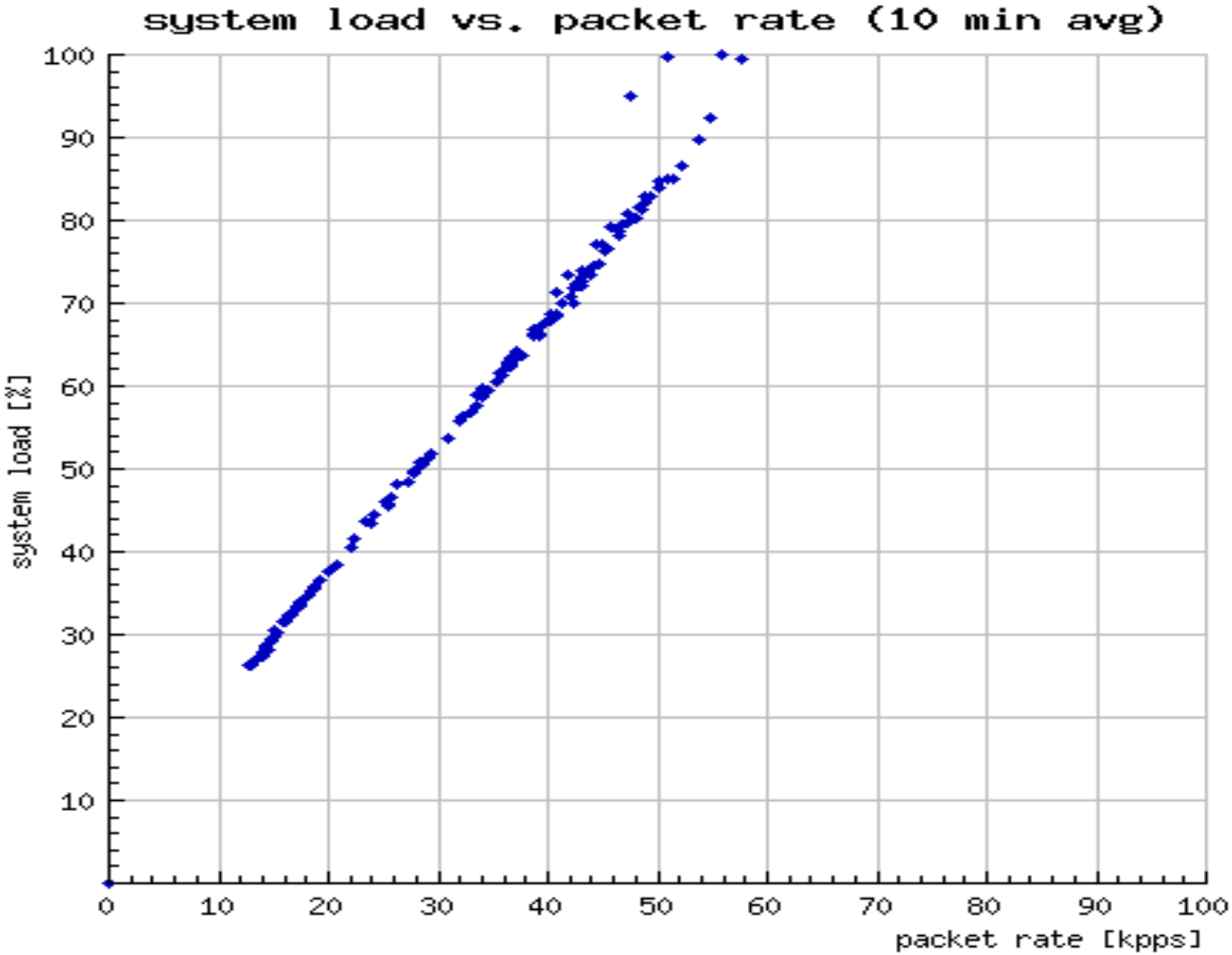
TRAFFIC FOR DESTINATIONS:

- INSIDE THE UNIVERSITY (CABLE / ADSL / DEPARTMENTS)
- OUTSIDE THE UNIVERSITY

TOP-TALKERS

- INSIDE THE UNIVERSITY
- OUTSIDE THE UNIVERSITY

SYSTEM LOAD OF METER



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MEASURING LIMITS - CONCLUSIONS

CURRENT PCs CAN EASILY HANDLE 0.5 GIGABITS

WITH SOPHISTICATED NETWORK CARDS SPEEDS OF SEVERAL GIGABITS SEEM POSSIBLE

ISN'T THIS GREAT?

MEASUREMENT RESULTS CAN BE USED FOR DIMENSIONING

MEASUREMENT RESULTS CAN BE USED FOR ACCOUNTING

COMPANIES CAN TRACE TRAFFIC FROM EMPLOYEES

GOVERNMENTS CAN TRACE ALL TRAFFIC

AOL-WARNER CAN DETECT ILLEGAL MP3s

NEW LAWS (DMCA, HOWARD BERMAN , …)

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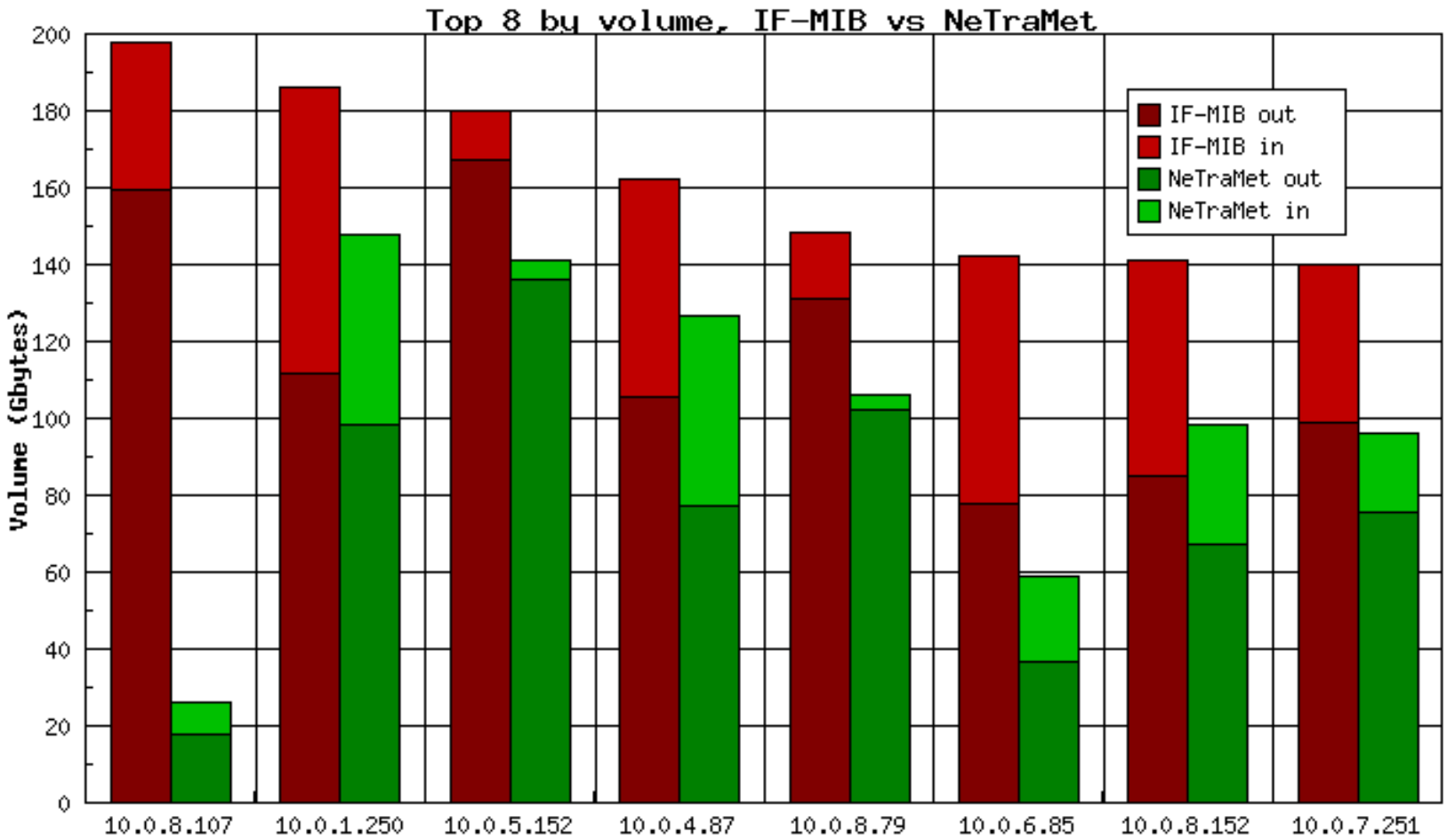
UNIVERSITY OF TWENTE

- BANDWIDTH CONSUMPTION FOR TOP USERS
- BANDWIDTH CONSUMPTION FOR AVERAGE USERS
- POPULAR PROTOCOLS / APPLICATIONS
- EXCHANGE BETWEEN STUDENTS & TEACHERS

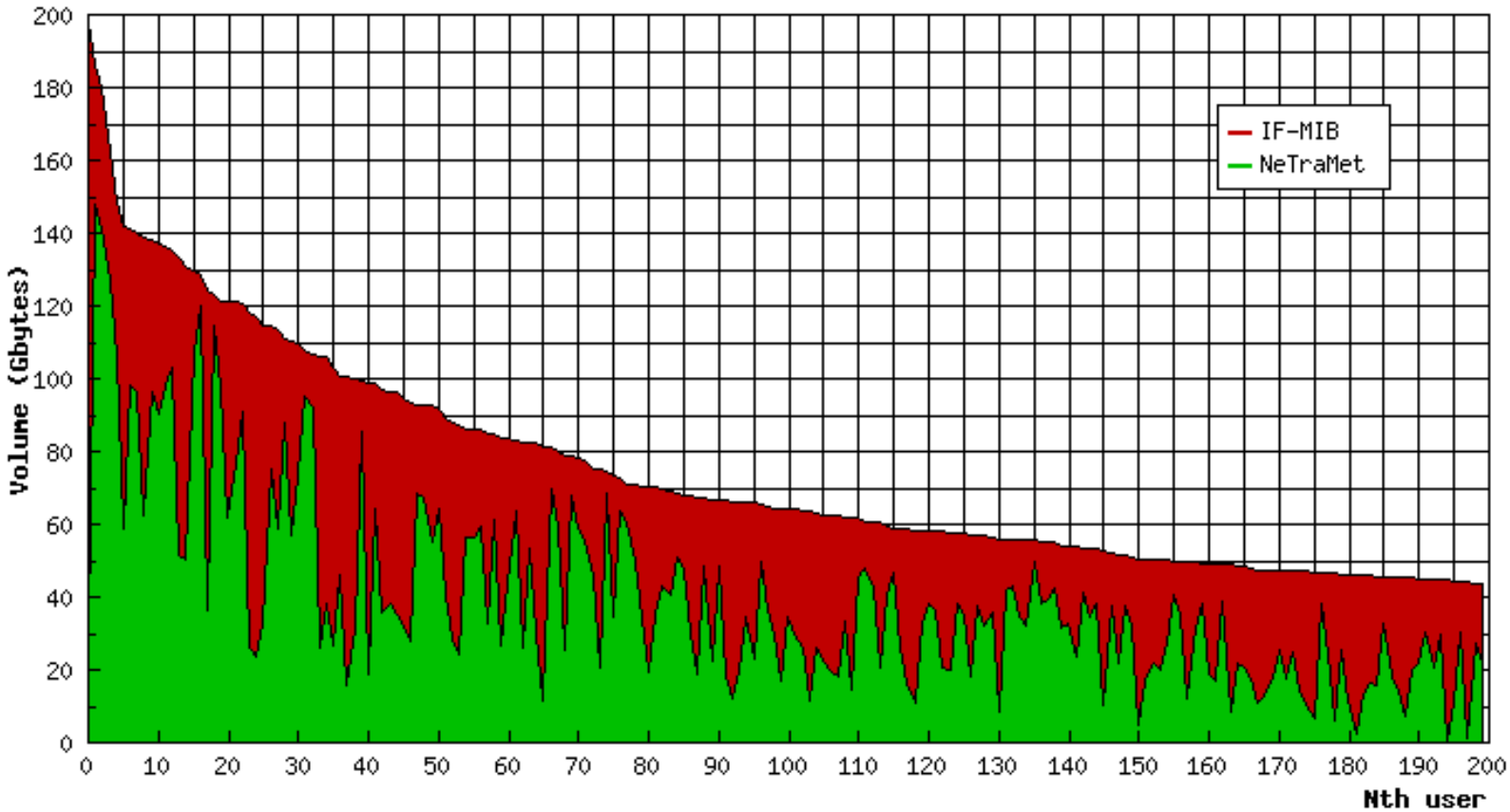
ABILENE BACKBONE OF INTERNET2

- POPULAR PROTOCOLS / APPLICATIONS

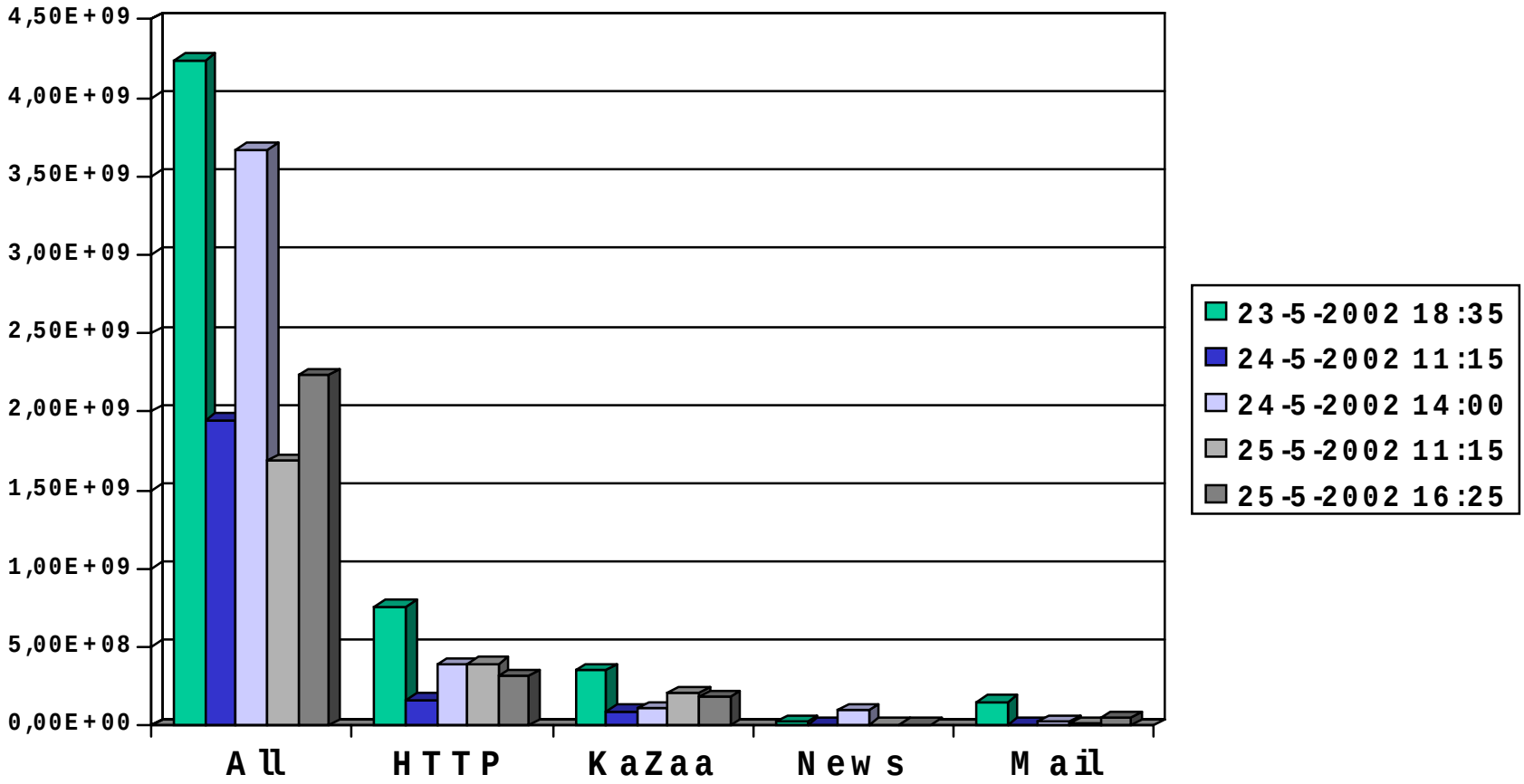
UNIVERSITY OF TWENTE: TOP USERS



UNIVERSITY OF TWENTE: AVERAGE USERS



UNIVERSITY OF TWENTE: WHAT STUDENTS DO



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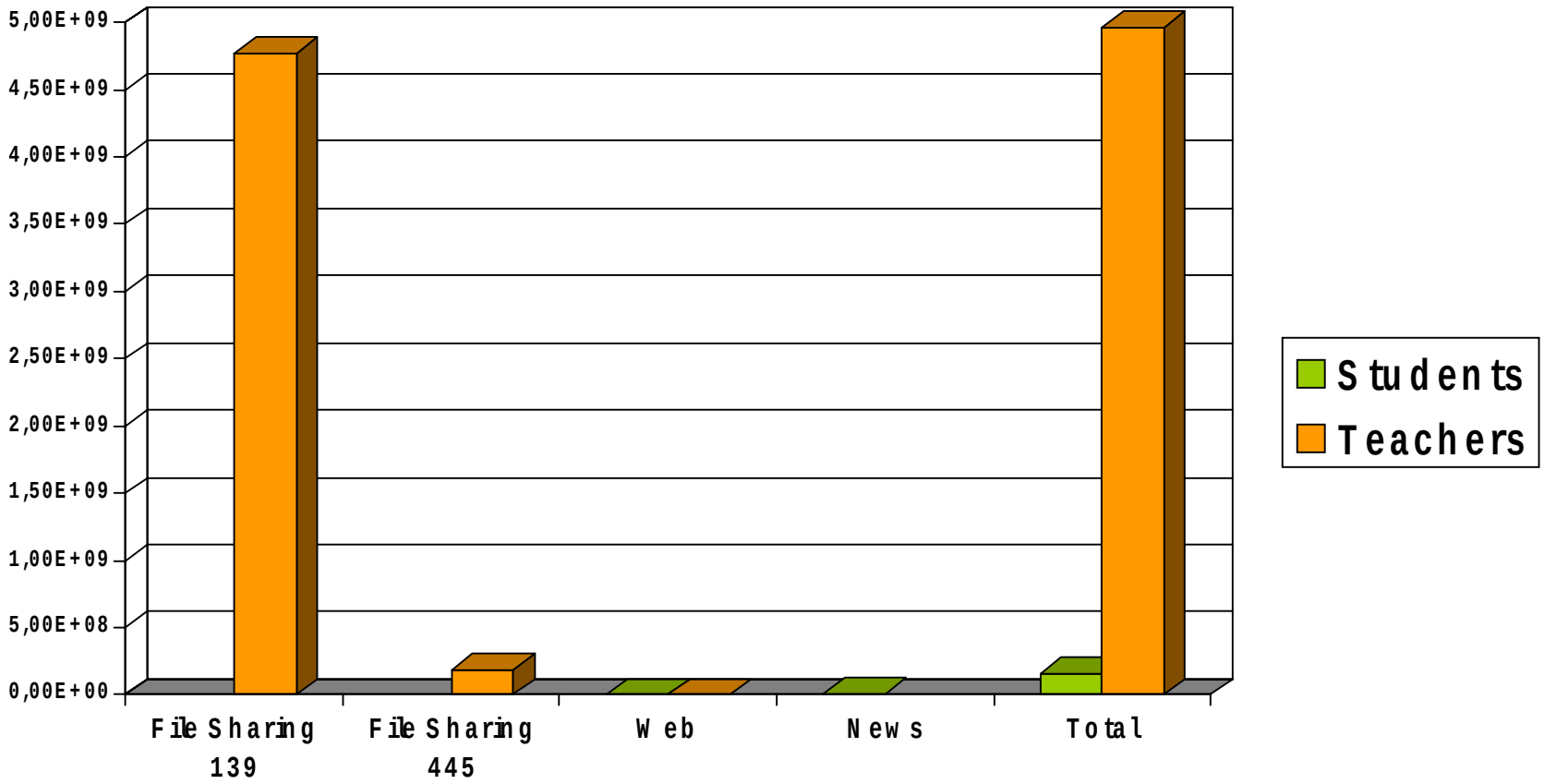
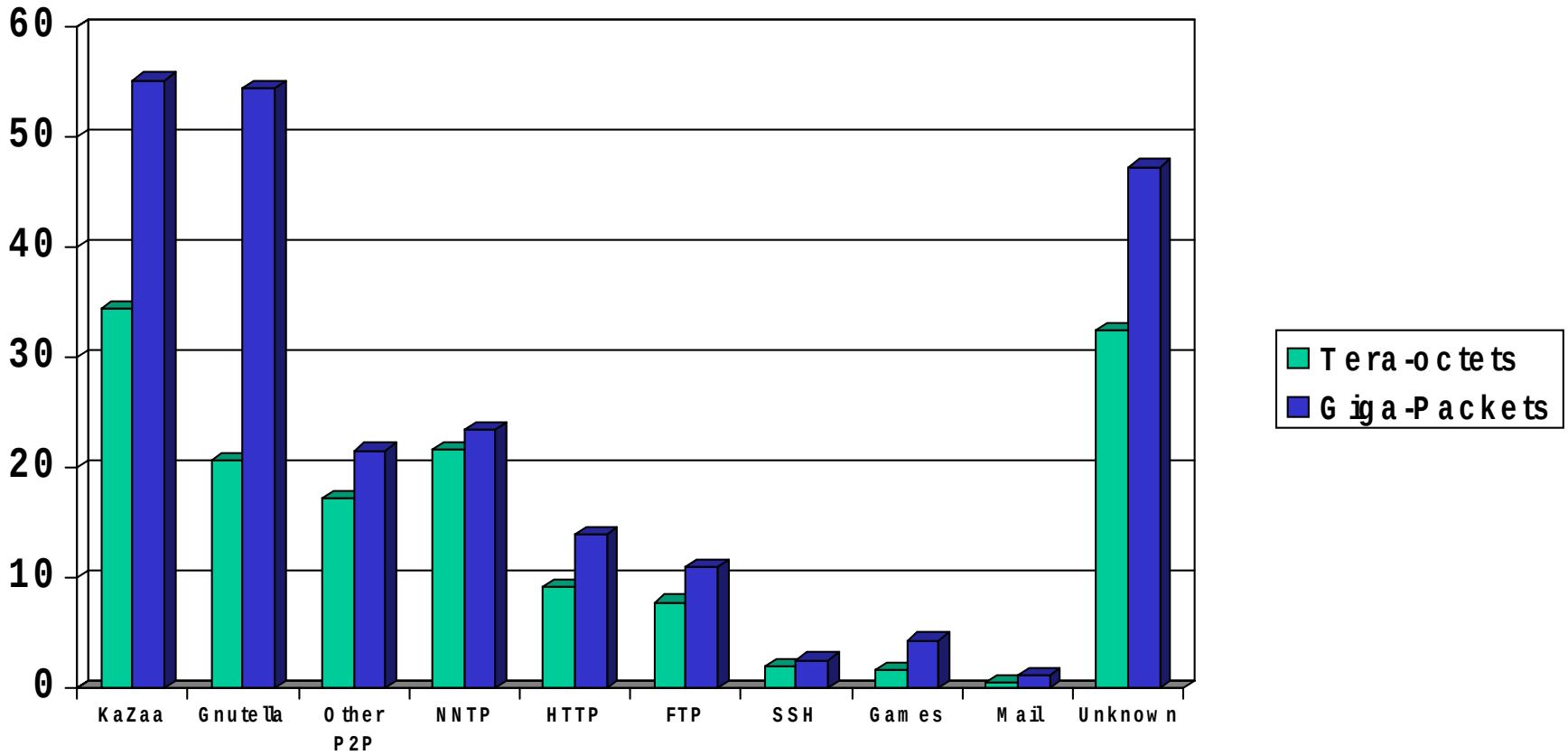
UNIVERSITY OF TWENTE
EXCHANGES BETWEEN STUDENTS AND TEACHERS



ABILENE BACKBONE: POPULAR APPLICATIONS



Data collected: 04-03-2002 / 10-03-2002
http://netflow.internet2.edu/weekly/20020304/

ISN'T THIS GREAT?

**IT IS SAFE TO ASSUME THAT BETWEEN
25 AND 75% OF ALL INTERNET TRAFFIC IS MP3, DIVX, ETC.**

ACCORDING TO THE FCC IN THE U.S. THE NUMBER OF:

- BROADBAND USERS = 12.8 MILLION / GROWTH = 80.3%
- DSL USERS = 3.9 MILLION / GROWTH = 95%

INTERNATIONAL FEDERATION OF THE PHONOGRAPHIC INDUSTRY:

- IN 2001 BACK FROM 35.7 TO 33.7 BILLION DOLLAR
- SINGLES 16% DOWN, ALBUMS 5%

YANKEE GROUP:

- 2001: 5.16 / 2005: 7.44 / 2007: 3.9 BILLION ILLEGAL MUSIC DOWNLOADS

FORRESTER RESEARCH:

- 2007: ONLINE MUSIC MARKET MORE THAN 2 BILLION DOLLAR

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LESSONS TO BE LEARNED

INTERNET IS HEAVILY USED FOR ILLEGAL CONTENT

MANY INDIVIDUALS EXCHANGE *LARGE* AMOUNTS OF TRAFFIC

NEXT GENERATION WIRELESS NETWORKS ARE NOT SUITED FOR THESE AMOUNTS

EXAMPLE: GPRS

COSTS GPRS

NETHERLANDS:
KPN: 2,25 EURO PER MB
VODAFONE: 1,50 PER MB

GERMANY:
E-PLUS: 25 EURO PER MB
VODAFONE: 1,90 EURO PER MB

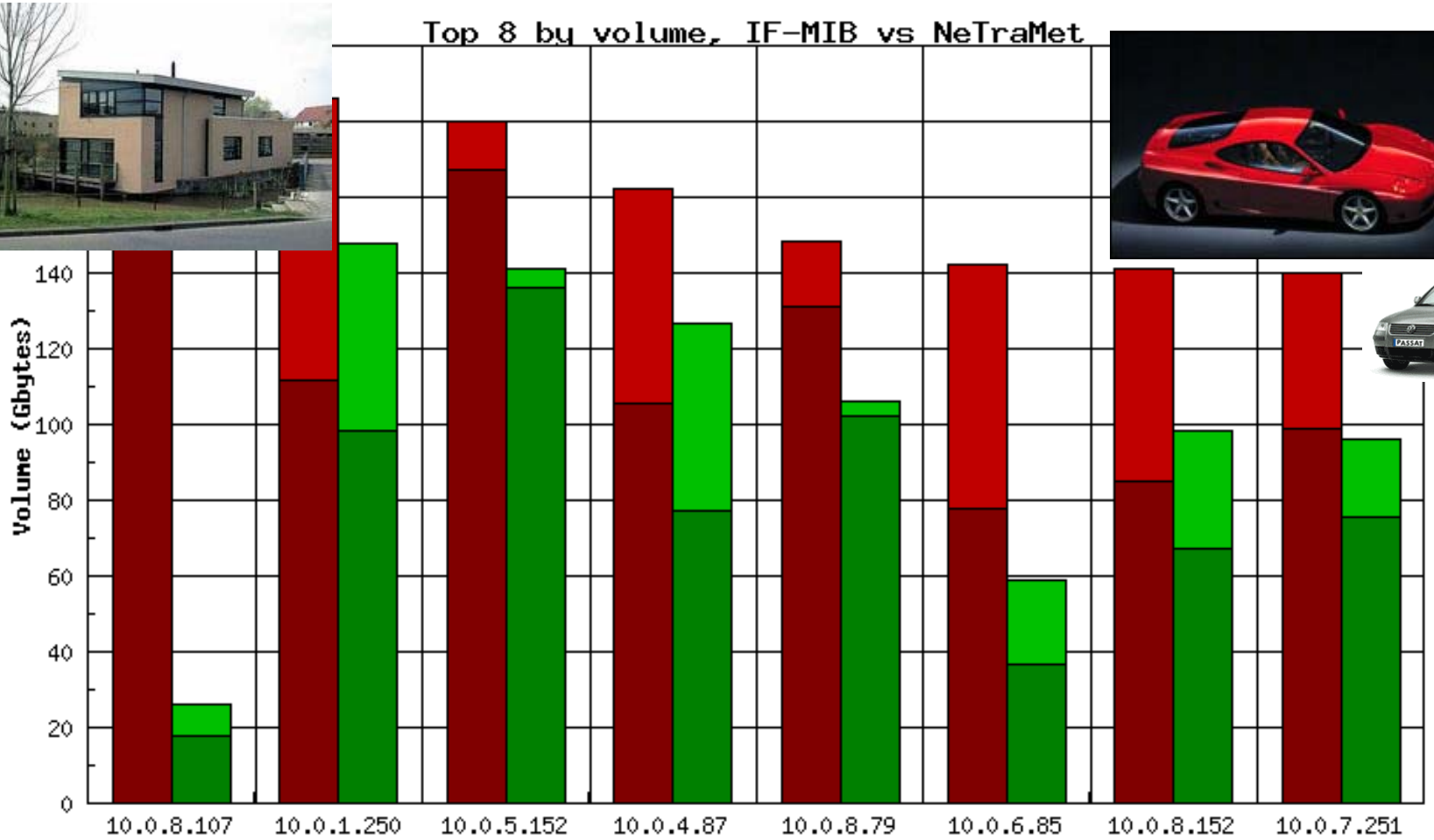
COSTS GPRS

COSTS OF COPYING 1 CD
(600 MB)

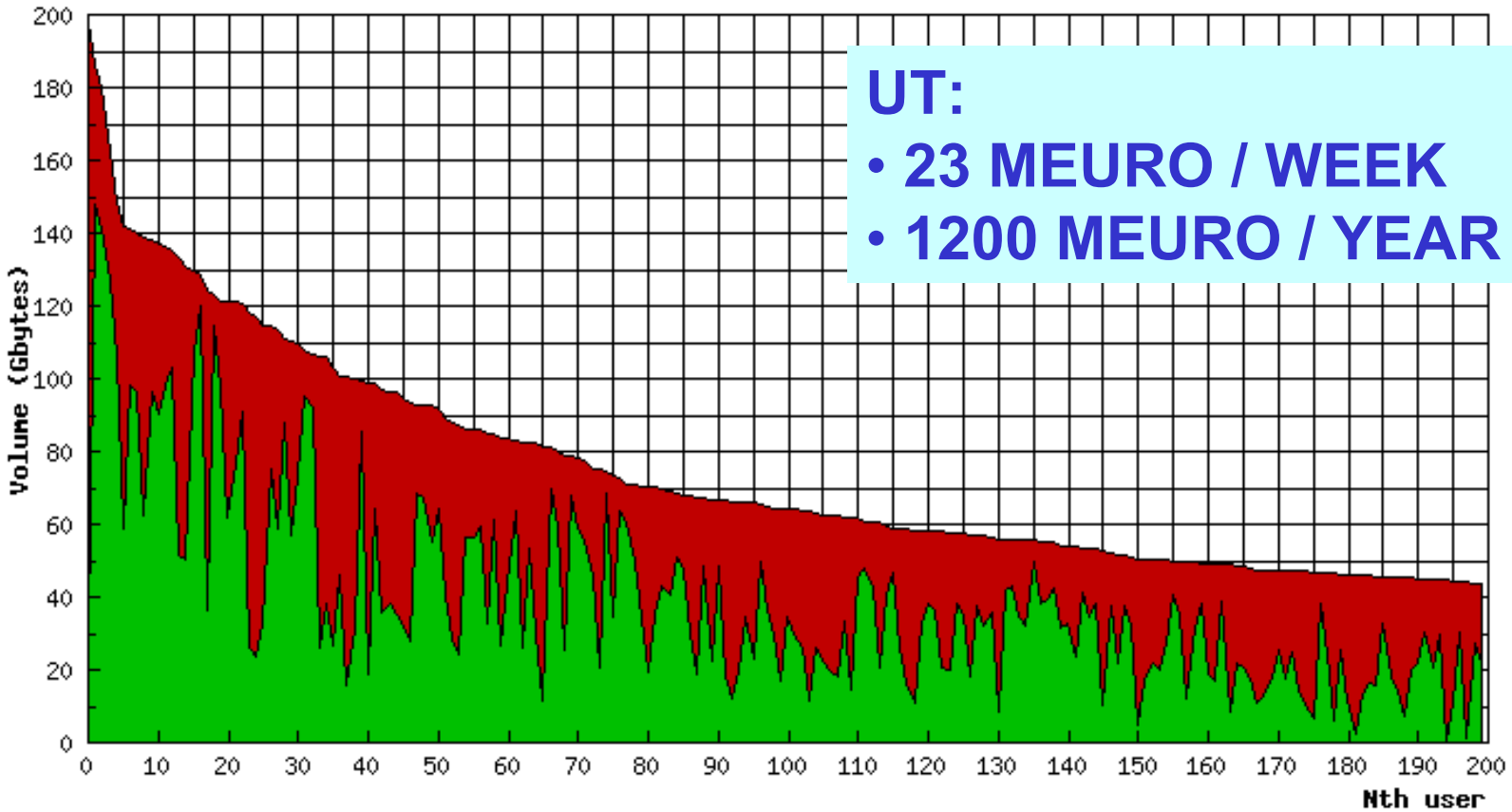
900 EURO

DOWNLOAD TIME: 13 HOURS

TOP USERS - UNIVERSITY OF TWENTE

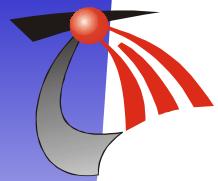


UNIVERSITY OF TWENTE



UT:

- **23 MEURO / WEEK**
- **1200 MEURO / YEAR**



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CONCLUSION

MEASURING INTERNET TRAFFIC IS FUN!