

Centre for
Telematics and
Information
Technology



University of Twente
The Netherlands

HIGH SPEED NETWORKS

HOW THE FUTURE WILL LOOK LIKE ...

AIKO PRAS

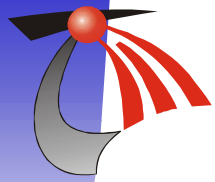
<http://wwwhome.ctit.utwente.nl/~pras>

29 APRIL 1999

SEMINAR HIGH SPEED NETWORKS

THE INTERNETWORKING EVENT

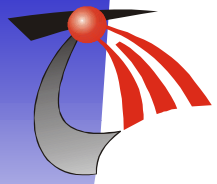
RAI - AMSTERDAM



CHARACTERISTICS

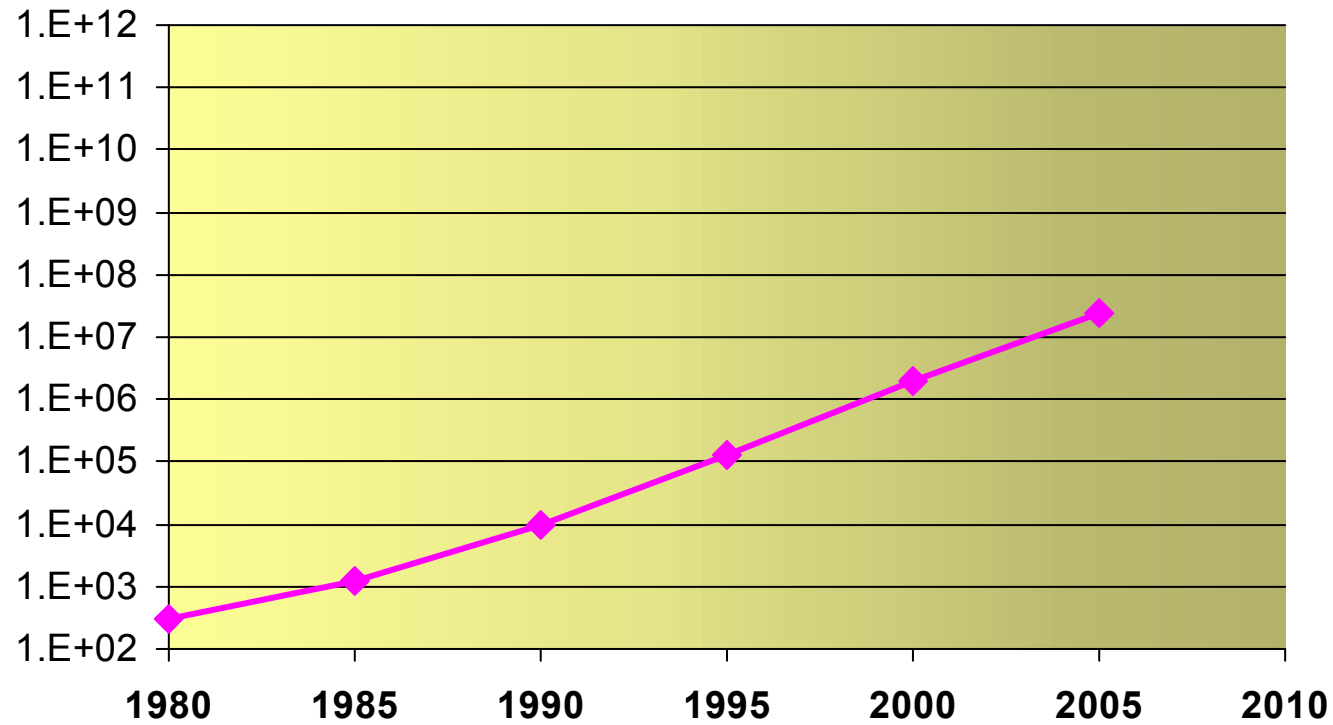
WHAT HAVE ALL HIGH SPEED NETWORKS IN COMMON?

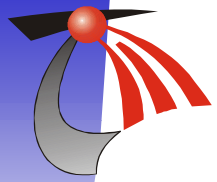
- **THEY SUPPORT IP**
- **VARIOUS UNDERLYING TECHNOLOGIES:**
 - **DWDM, SDH, ATM**
 - **GIGABIT ETHERNET**
 - **XDSL**
 - **UMTS**



CAPACITY GROWTH - I

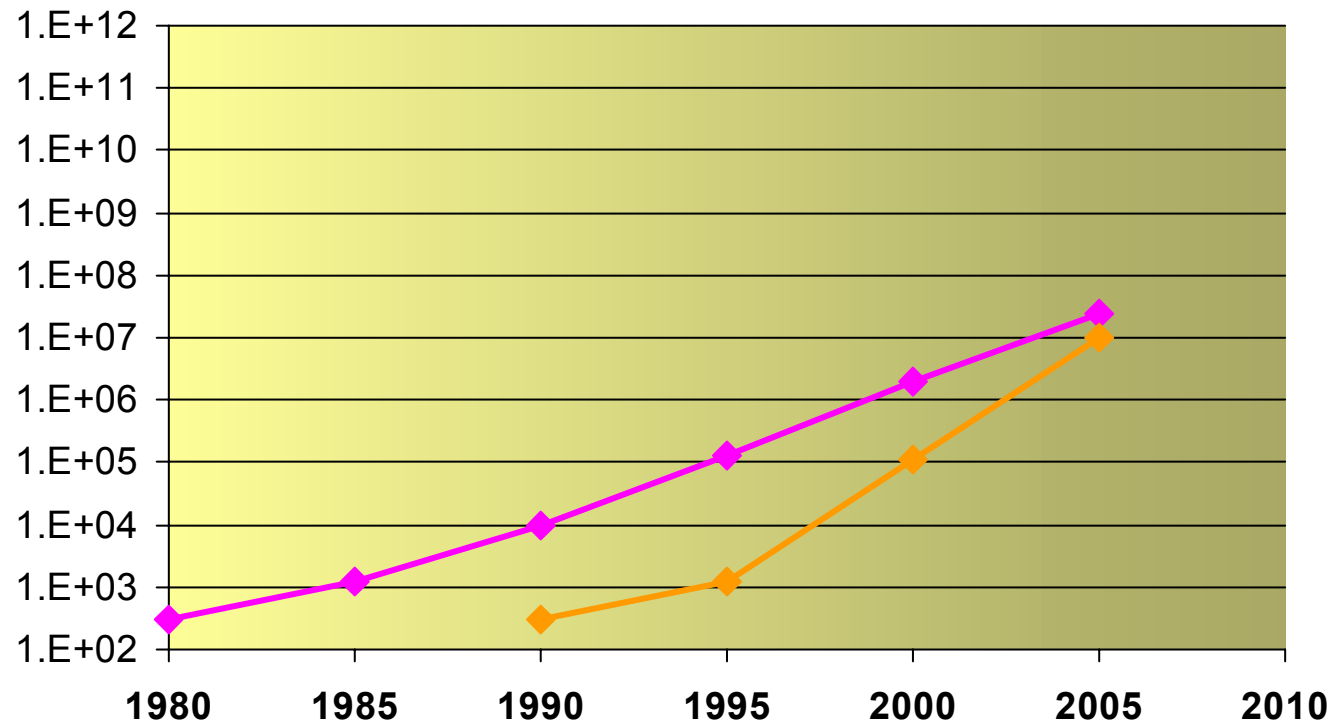
LOCAL ACCESS - FIXED (IN BPS)

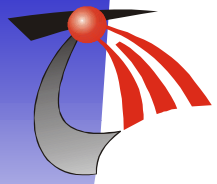




CAPACITY GROWTH - II

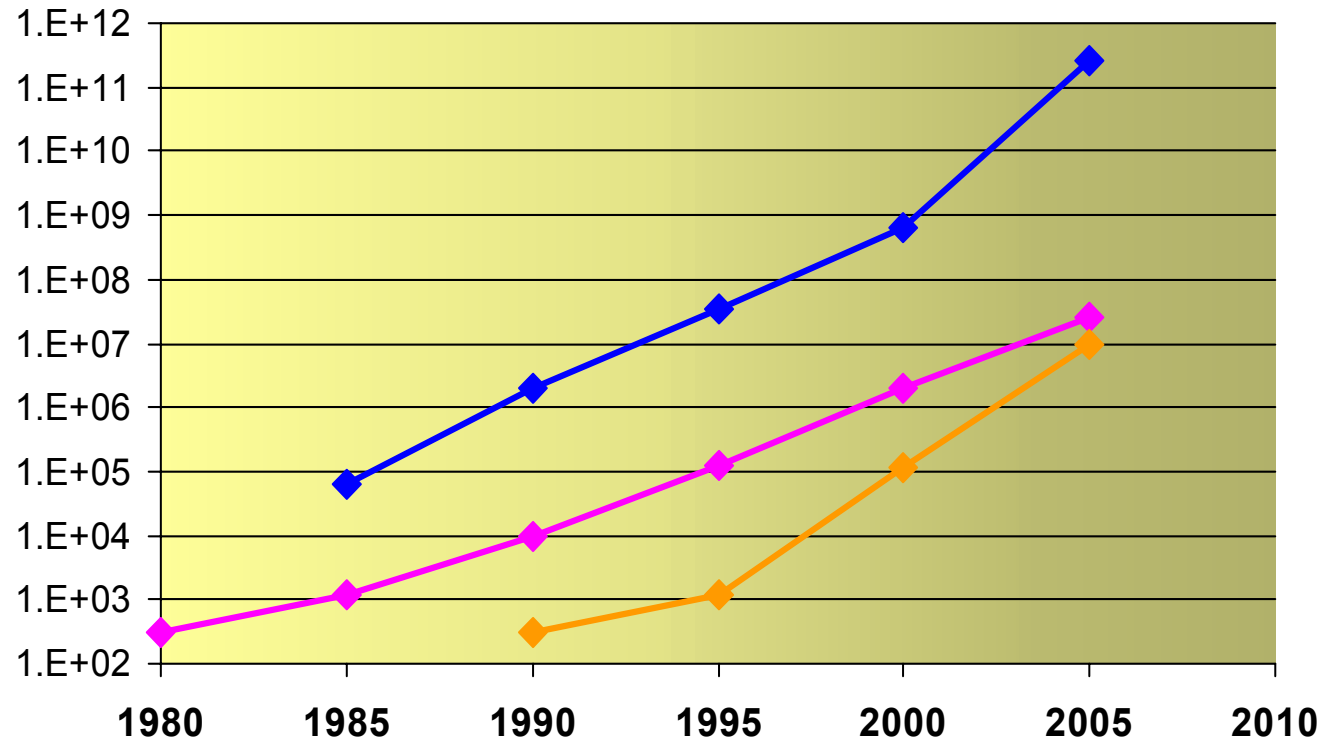
LOCAL ACCESS - WIRELESS (IN BPS)

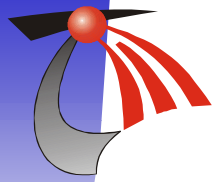




CAPACITY GROWTH - III

BACKBONE LINE CAPACITY (IN BPS)





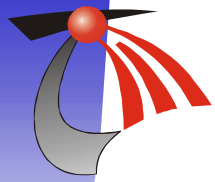
CAPACITY GROWTH - IV

CAPACITY ACCESS LINE IN THE YEAR 2005:

- **4 TO 10 DIGITAL TV SIGNALS**
- **100 TO 250 HIFI AUDIO SIGNALS**
- **2000 WEB PAGES PER SECOND**

CAPACITY BACK BONE LINE IN THE YEAR 2005:

- **100.000 DIGITAL TV SIGNALS**
- **2.500.000 HIFI AUDIO SIGNALS**
- **15 MILLION TELEPHONE CALLS**
- **25 MILLION WEB PAGES PER SECOND**

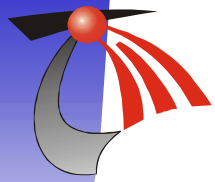


CAPACITY GROWTH - V

DEVELOPMENT GOES ON!

CAPACITY BACK BONE IN THE YEAR 2010:

- **3 MILLION DIGITAL TV SIGNALS**
- **75 MILLION HIFI AUDIO SIGNALS**
- **500 MILLION TELEPHONE CALLS**
- **1 BILLION WEB PAGES PER SECOND**



IS THIS ENOUGH?

NO!

REAL-TIME APPLICATIONS DEMAND BETTER QoS

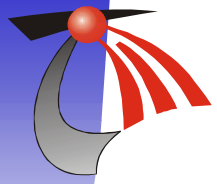
- VIDEO TELEPHONY
- VIDEO CONFERENCING
- VIDEO DISTRIBUTION

FOR (WIRELESS) ACCESS WE NEED RESERVATION SCHEME'S

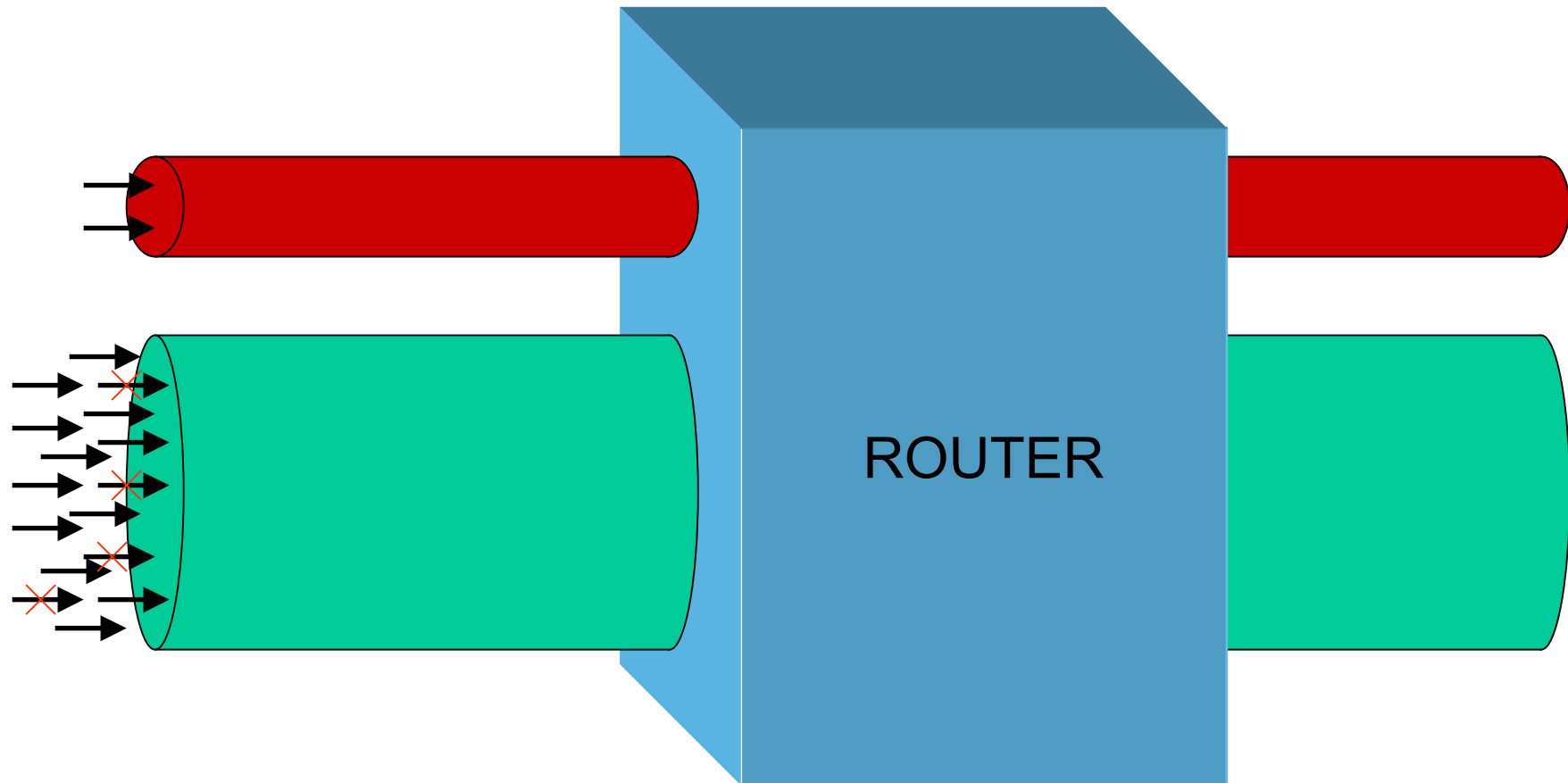
IETF: INTSERV

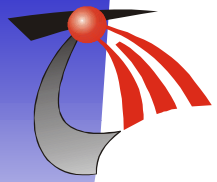
FOR THE BACKBONE RESERVATION DOESN'T WORK

IETF: DIFFSERV

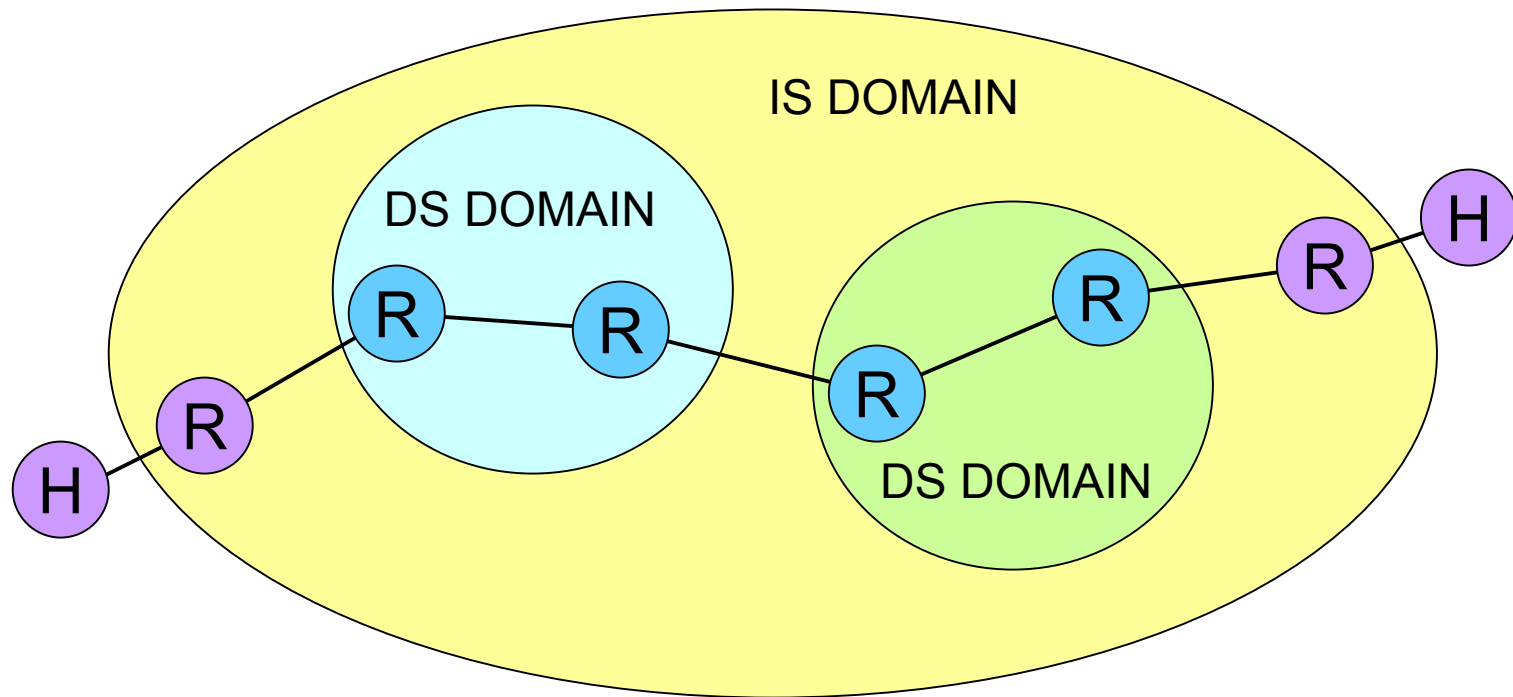


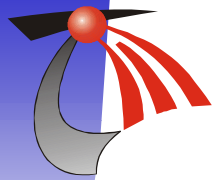
DIFFERENTIATED SERVICES - I





DIFFERENTIATED SERVICES - II

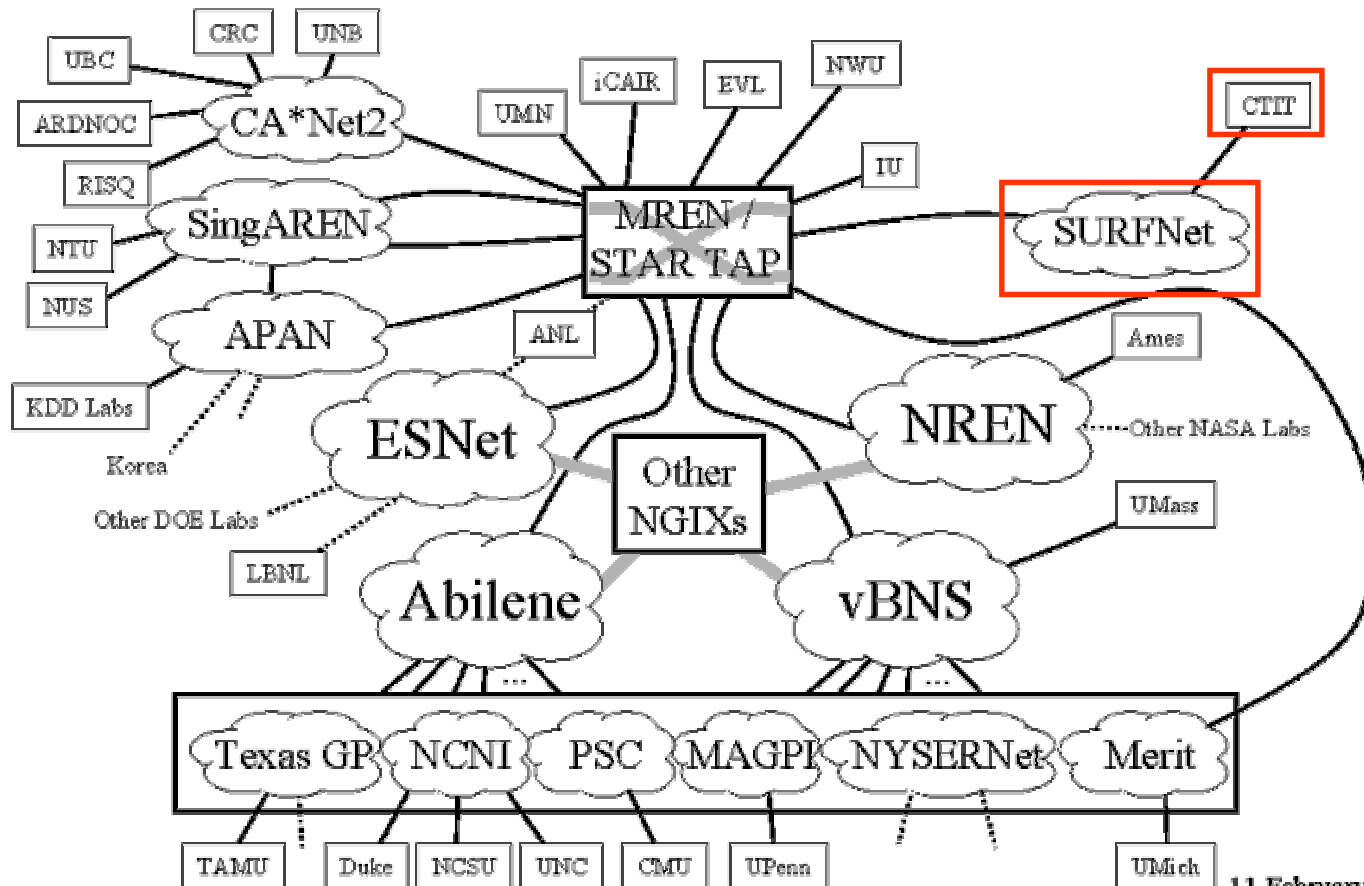


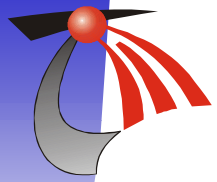


DIFFERENTIATED SERVICES - TESTBED

Initial QBone Participants and Connectivity*

* Actual connectivity and participant group will vary as deployment progresses

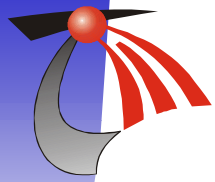




ACCOUNTING - I

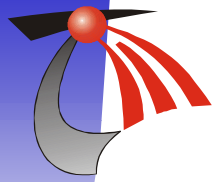
DIFFERENT QUALITIES?

DIFFERENT PRICES!



ACCOUNTING - II

- **IS IT POSSIBLE TO HAVE DIFFERENT TARIFS FOR LOCAL, NATIONAL AND INTERNATIONAL TRAFFIC?**
- **IS IT POSSIBLE TO HAVE DIFFERENT TARIFS FOR INTER AND INTRA OPERATOR TRAFFIC?**
 - **SHOULD ACCOUNTING BE BASED ON VOLUME?**
 - **WHAT INFORMATION IS NEEDED FOR ACCOUNTING**
 - **WHERE SHOULD THIS INFORMATION BE COLLECTED?**
 - **WHO MAKES THE BILL?**



WHAT ROLE PLAYS THE NETHERLANDS?

INTERNET NEXT GENERATION PROJECT

CTIT (UT), ERICSSON, KPN-RESEARCH, TI-CO

<http://ing.ctit.utwente.nl/>

- PARTICIPATION IN INTERNET2, QBONE, IETF AND IRTF
 - IMPROVE KNOWLEDGE IN THE NETHERLANDS

FITS WITHIN GIGAPORT



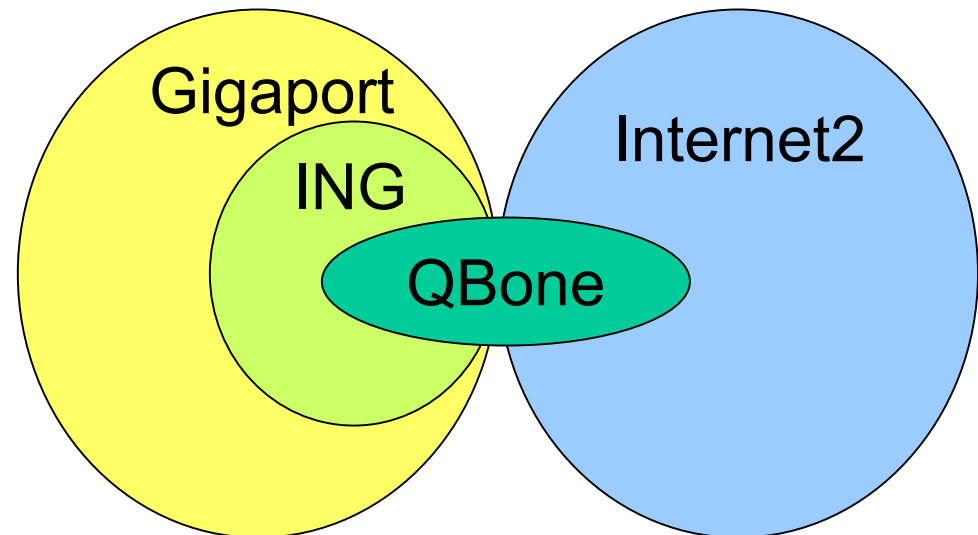
GIGAPORT

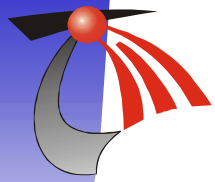
EZ, OC&W, V&W

142 MFL

ICES / KIS

- **GIGANET: SURFNET**
- **GIGAWORKS: TI**





CONCLUSIONS

- INTERNET CAPACITY DOUBLES EVERY 9 MONTHS
- FOR REAL-TIME APPLICATIONS WE NEED MORE
 - THE **IETF** IS WORKING ON **DIFFSERV** AND **INTSERV**
 - **QBONE** IS THE WORLD-WIDE TESTBED
- THE NETHERLANDS CONTRIBUTES TO THIS
 - **GIGAPORT** AND THE **INTERNET NEXT GENERATION** PROJECT