Universiteit Utrecht

Multiple GIGAbit Networks for Research Applications

Cees de Laat
Computational Physics department
Utrecht University

Contents

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- **Structure and research topics FYI**

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- Rise and Fall of ATM

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- FYI initiatives

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Computational Physics

- **Located in Minnaert Building 3th floor**
  - 1 Professor
  - 3 staff
  - 1 secr
  - ± 6 on projects
  - ± 10 stud
  - 3 stag
  - 2 industry

Research subjects - 1, 2

- **Computational Physics**
  - **Ocean and weather modeling**
  - **Solid State physics**
  - **Supercomputing massive parallel system**
  - **Code distribution and optimization**
- **Computer based learning systems**
  - **SENS project**
  - **Computer and network based college**
  - **WEB based (Java, HTML,Db, Groupware)**

Research Subjects - 3

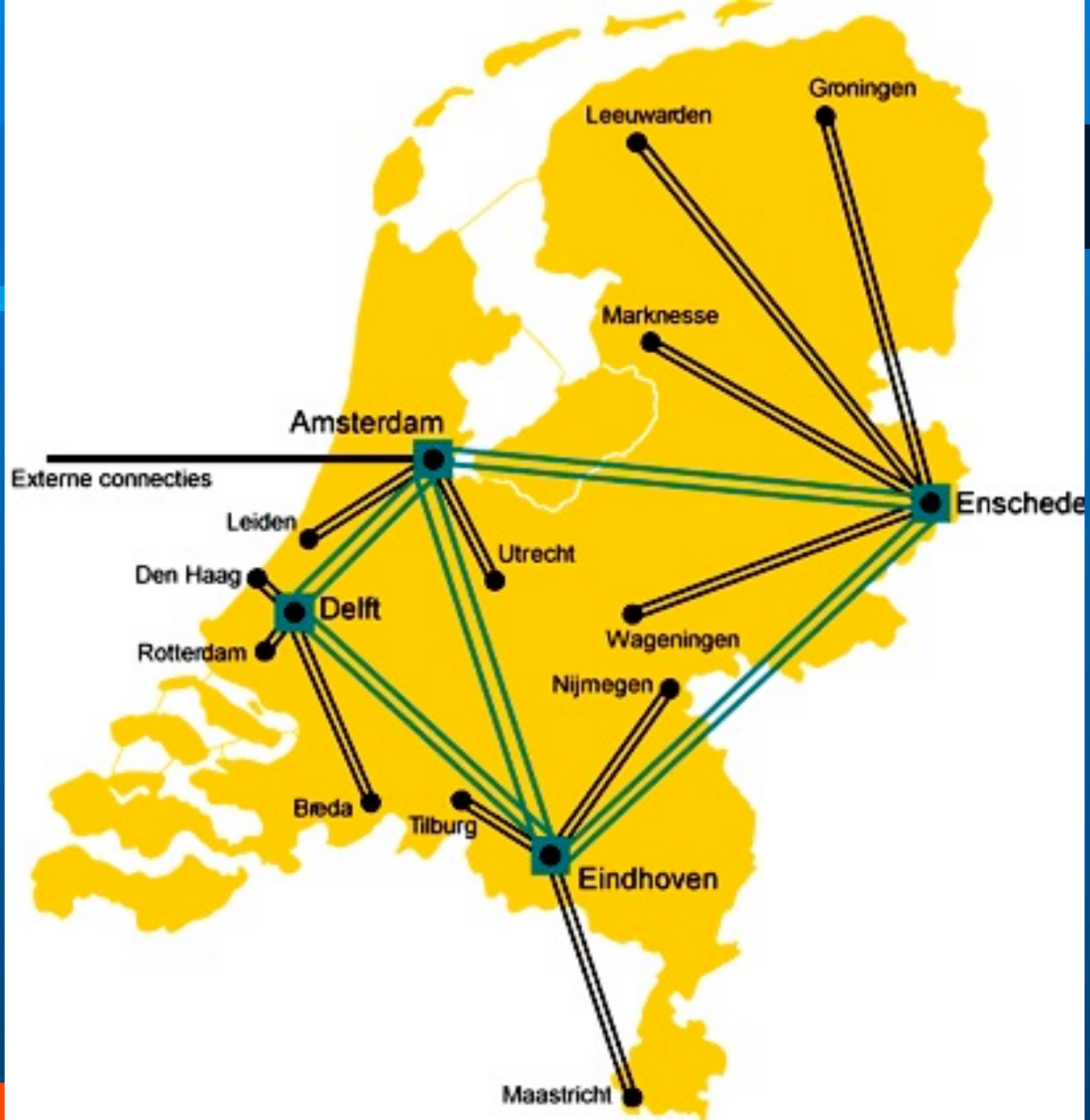
- **EU project REMOT / DYNACORE**
  - **Collaboratories, virtual control rooms**
  - **Support science at the home institutes**
  - **Groupware, Videoconference tools point to point and point to multipoint**
  - **Corba services, distributed object db**
  - **www.phys.uu.nl/~dynacore**

Research Subjects - 4

- **Networking**
  - **Focus on applications for Physics**
  - **QoS networks for computing, collaboratories and telelearning**
  - **Distributed systems topics:**
    - **Modeling**
    - **Optimization**
    - **Simulation**
    - **Emulation**

SURFnet

- Network backbone for University's
- 4 cluster leaders, ~ 14 POP’s
- 155 Mbit/s to USA
- Services <-> research
- TF-Ten - Quantum project
- SURFnet 4 -> move to 155 Mbit/s ATM
- 1999 -> SURFnet 5, the gigaport project


Groningen
Leeuwarden
Marknesse
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Externe connecties
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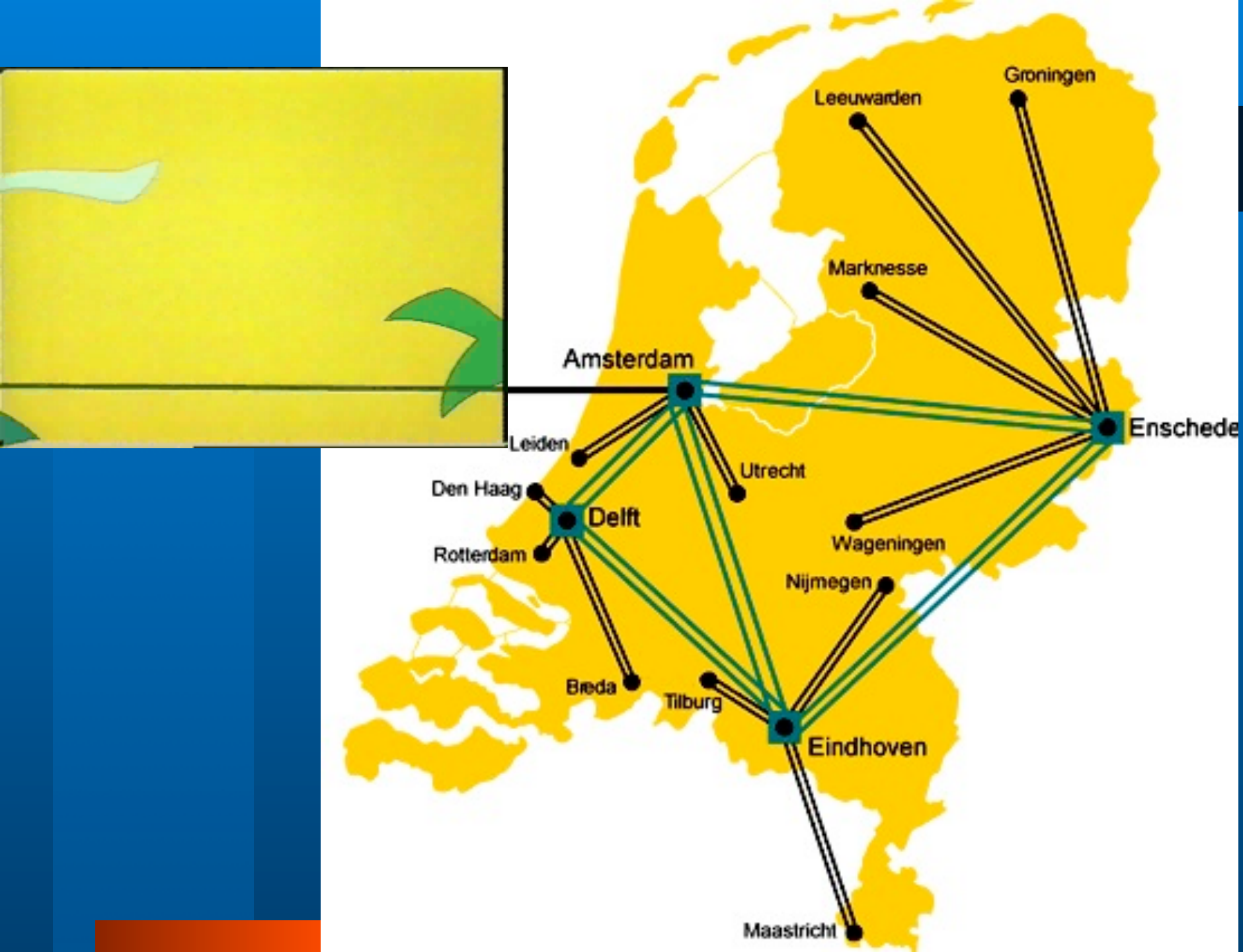
Rotterdam
Nijmegen
Breda
Tilburg
Eindhoven
Maastricht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The train model

- **ATM looks so simple**
  - **Fixed size cell's with address information**
  - **Audio and video mixed with data**
  - **Seems very deterministic and predictable**

Switches got complex

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- **Switched Virtual Connections**

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The swamp

- **AAL, ABR, ATM, AvCR, CAC, CBR, CDV, CLP, CLR, CLR0, CRM, CTD, DSP, DTL, EPD, ES, ESI, GCAC, IAS, ICR, IISP, ILMI, 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, ...**

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  - **Long turnaround (rtt ≈ days)**
  - **Expensive rented lines system**

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- **Throw Bandwidth at the problem**
  - Might go wrong at bottlenecks
  - Easiest solution (UBR).

Positive remarks on ATM

- European PTT's learned to talk (n^2)
- Using CBR makes it a flexible leased lines system
- Can indeed give guaranteed RTT's and QoS

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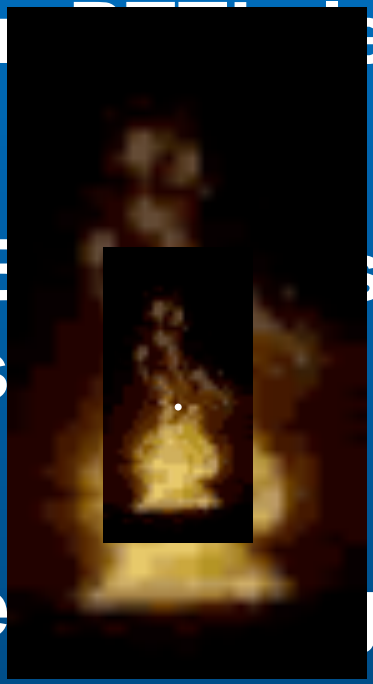

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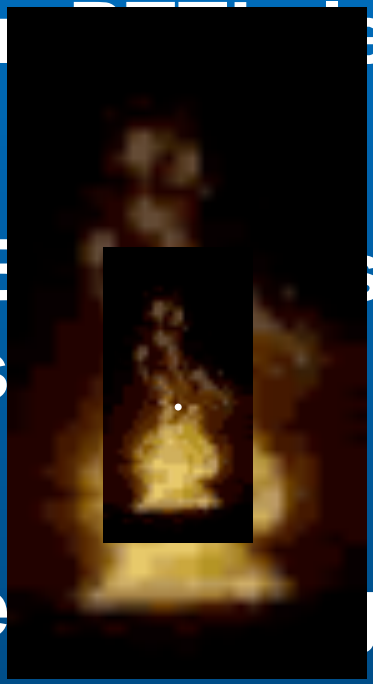

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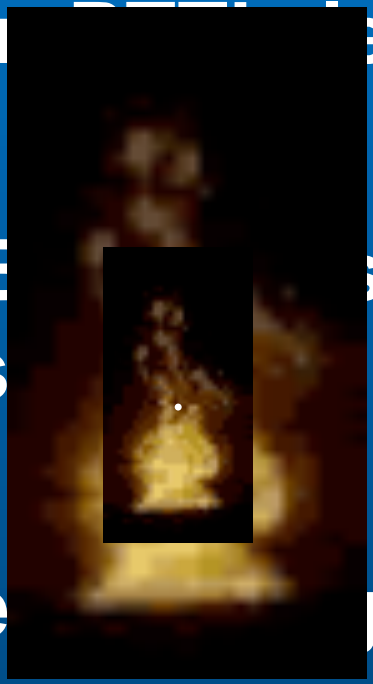

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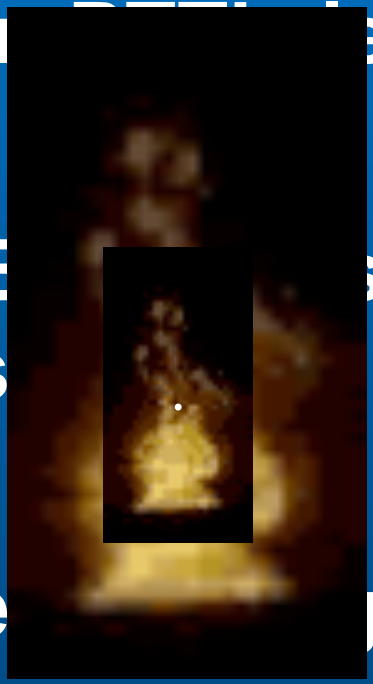

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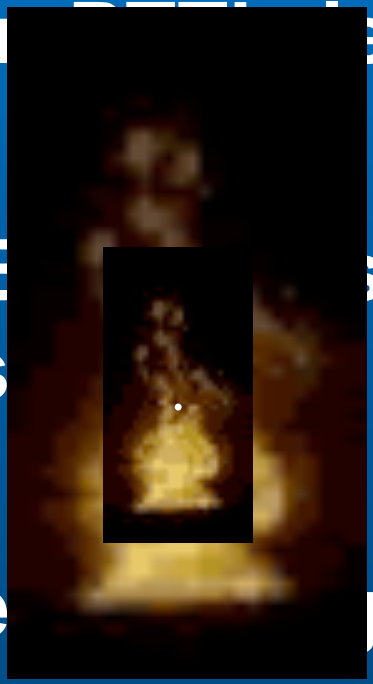

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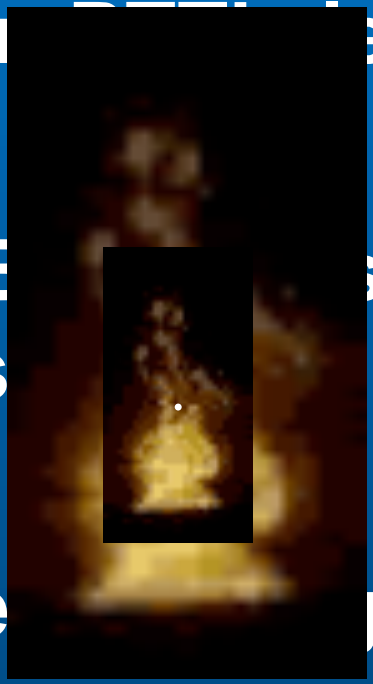

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  - TOS bits in IPv4 and IPv6, diffserv

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  - Decentralization places bills at end user
  - Users have a different “core business”
  - Internet is perceived as free and it works
- We must move forward
- Applications are the key

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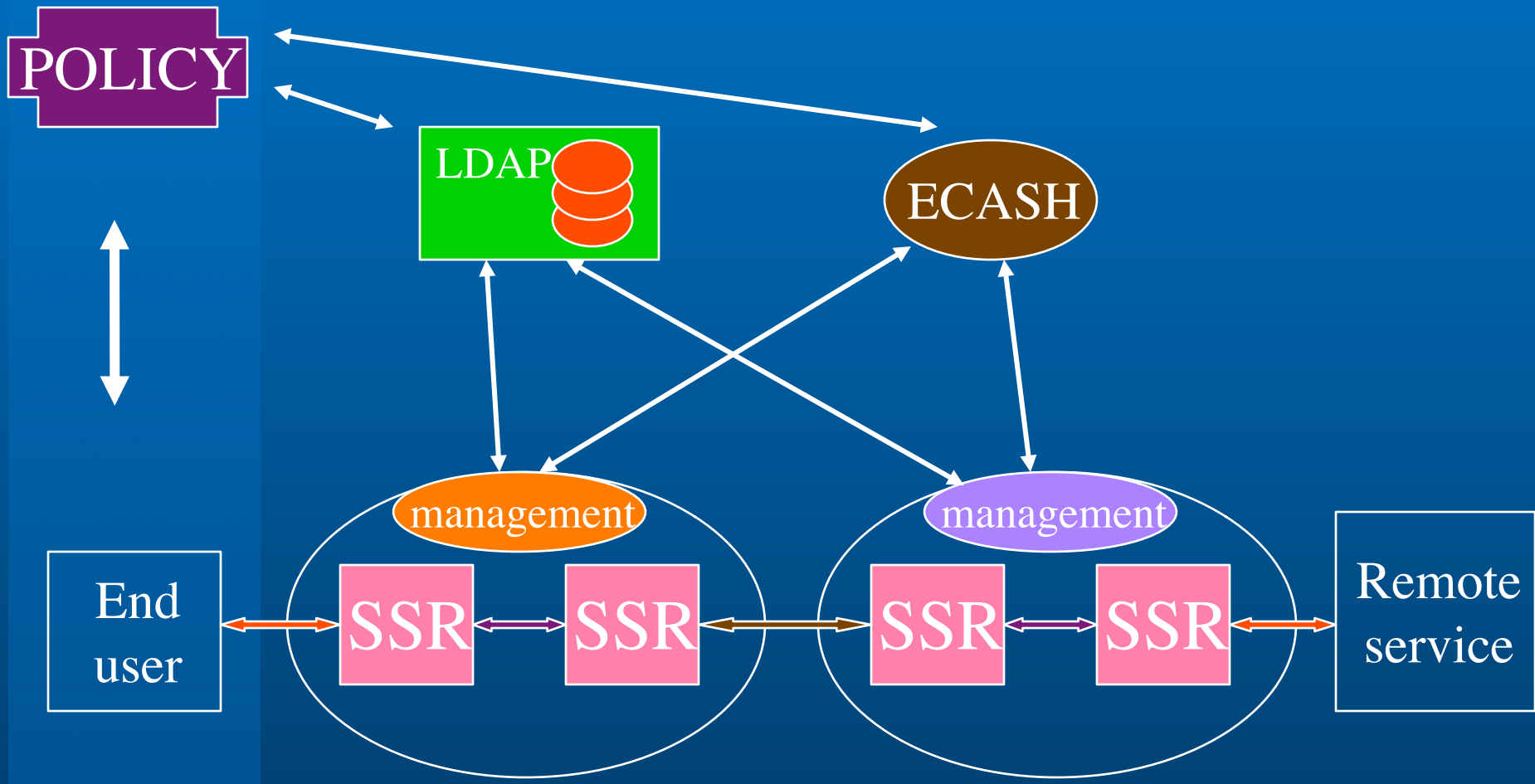
- Use chipcards with certificates to do CAC

Possible architecture



SURFnet5 - GIGAport

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- **80 gigabit backbone**

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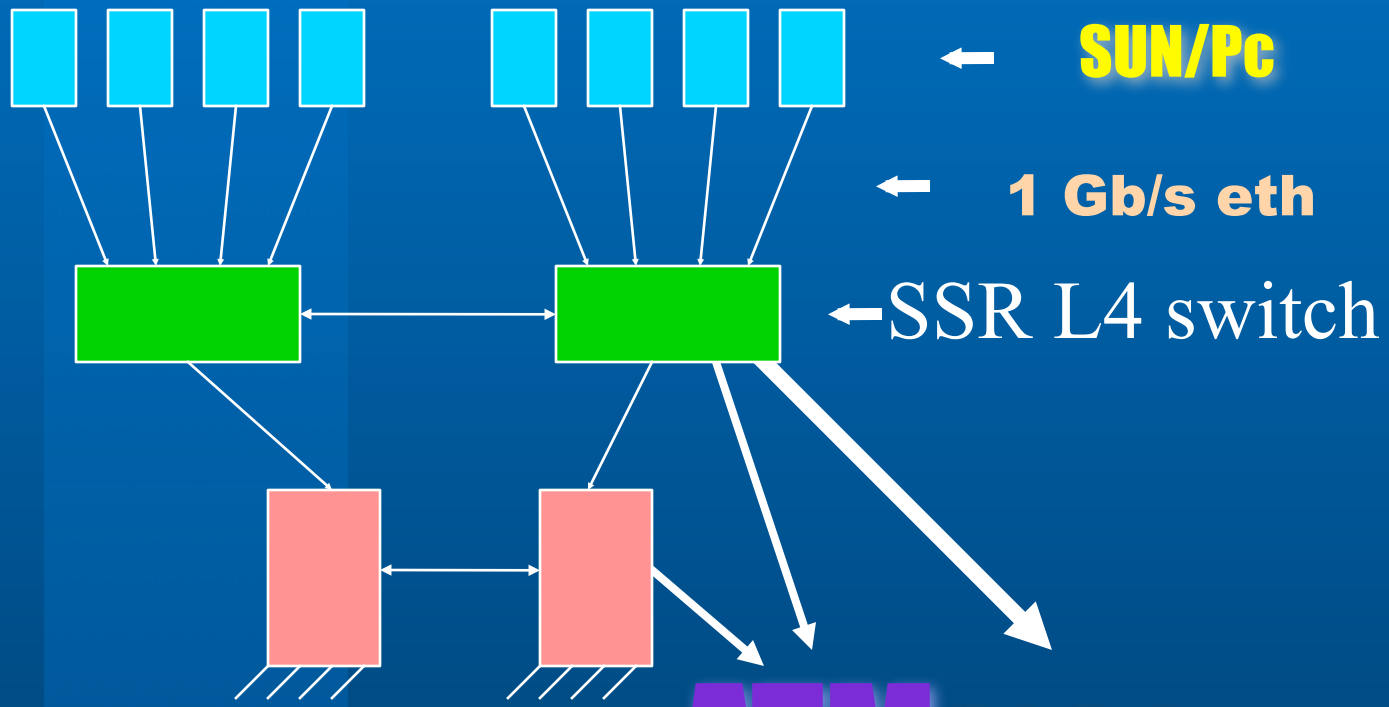

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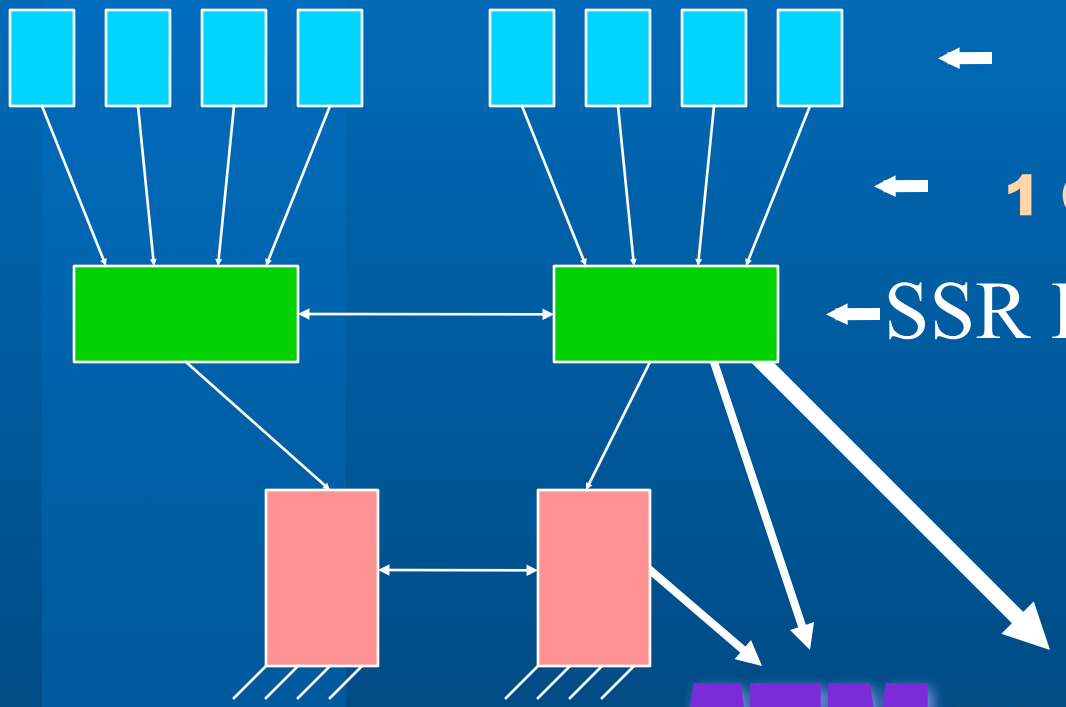

SUN/Pc

1 Gb/s eth

SSR L4 switch

Workstations/Pc's ATM GIGAnet

GIGAcluster applications

- REMOT/DYNACORE, collaboratory
- Objectivity, distributes db's
- Corba, object and message passing
- Qbone, Quality of Service on WAN
- MCU's, scalable video distribution
- SURFnet 5, GIGAbit producer/sink
- DAS - Computing
- LLT (LFAP, CAC, COPS, IPSEC, …)

T hanks

More info:

http://www.phys.uu.nl/~delaat
http://www.phys.uu.nl/~wwwfi
http://www.phys.uu.nl/~dynacore

QUESTI