The significance of the new internet standards for collaboratories.

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For the DYNACORE collaboration.

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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 availabillity
  - 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

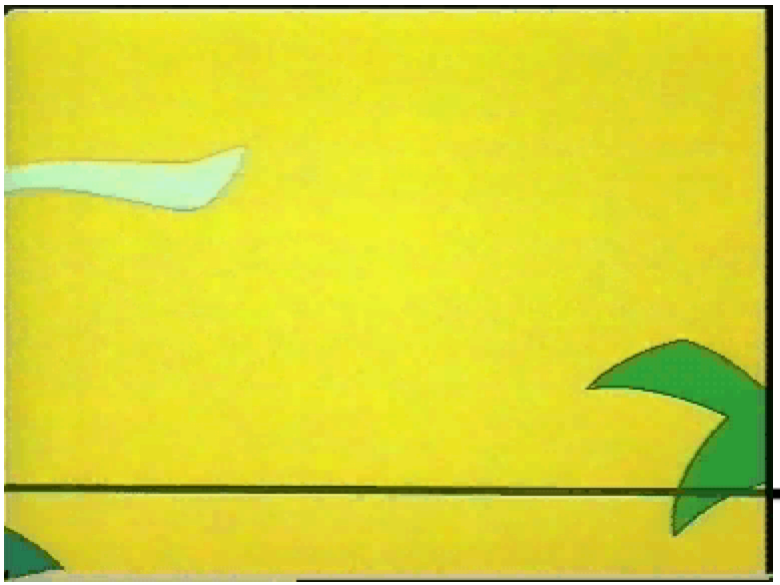
The fate of ATM

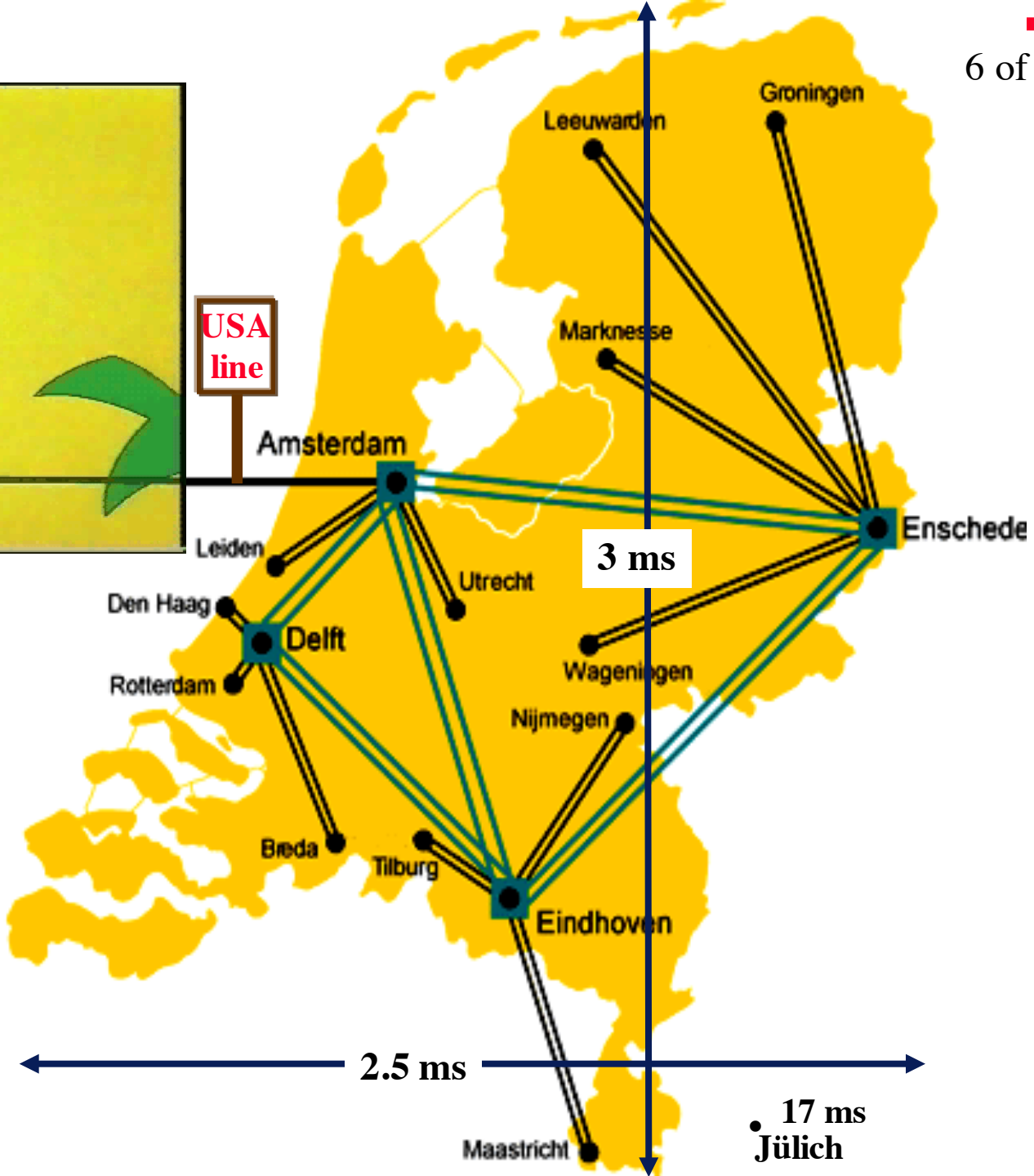
Why not ATM

- 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!

Multi Kingdom Problem

- 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




USA line
Amsterdam
Leeuwarden
Groningen
Marknesse
Enschede
Leiden
Utrecht
Den Haag
Delft
Rotterdam
Wageningen
Nijmegen
Breda
Tilburg
Eindhoven
Maastricht
3 ms
2.5 ms
17 ms
Jülich

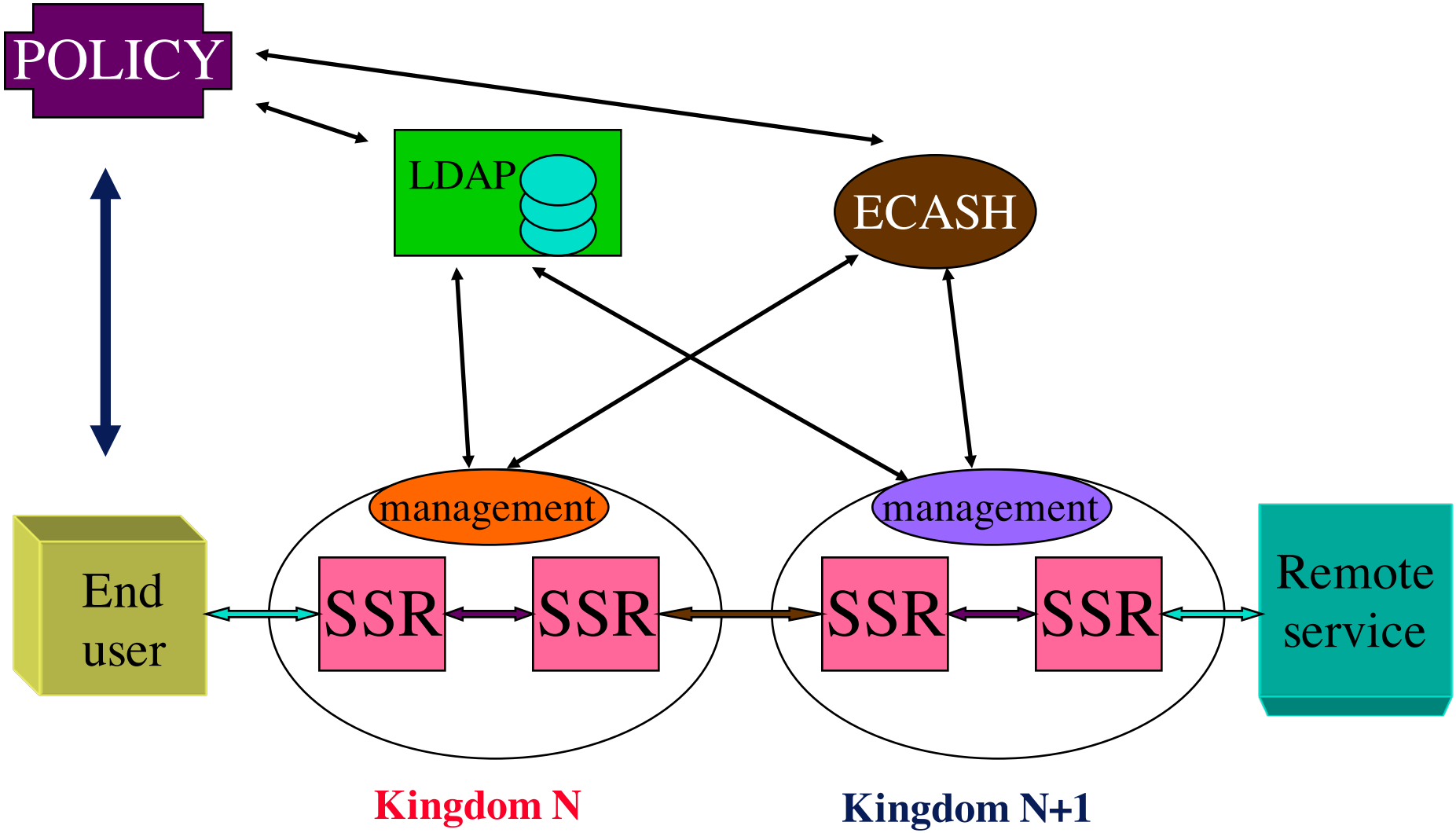
```
MacsBug 6.5.4a6, Copyright Apple Com

NMI (user entered MacsBug on purpose)

 17-Jun-1999 11:51:26 PM (since boot =
 Current application is “Microsoft Power
 Machine = 312 (PowerBookG3Series),
 ROM version $077D, $41F6, $0002 (R
 VM is on; paging is currently safe
 NIL^ = $FFC10000
 Stack space used = -8018882
Address FFC0693A is in the ROM at _PutIcon+037
68020 Registers
 D0 = 00000000     A0 = FEE00000     USP
 D1 = 0000003C     A1 = 0028B9A4     MS
 D2 = 008D49B0     A2 = 00019570     I      055E4
 D3 = 0B25FAF0     A3 = 00000000           0016D494
 D4 = 746FFF00     A4 = 0B25F754     ACR = 00000001     SFC = 0
 D5 = 0000FFFE     A5 = 0B9F3        CAAR = 00000000    DFC = 0
 D6 = 6C204301     A6 = 0B25   2C     PC  = FFC0693A
 D7 = 00010000     A7 = 0B     055E4  SR  = SmxnzvC      Int = 0

 Calling ch      6/R1 links
 Back c
 0B25F      FD83C  EmToNatEndMoveParams+00014
 0B25F      67F8
 0B25F84    C68A8
 0B25F7D8   PPC  1B249B30
 0B25F780   PPC  1B2905DC
 0B25F710   PPC  1B28F3FC
 0B25F6A0   PPC  1AE7BE98  AfxWaitNextEvent+00050
```

Just kidding

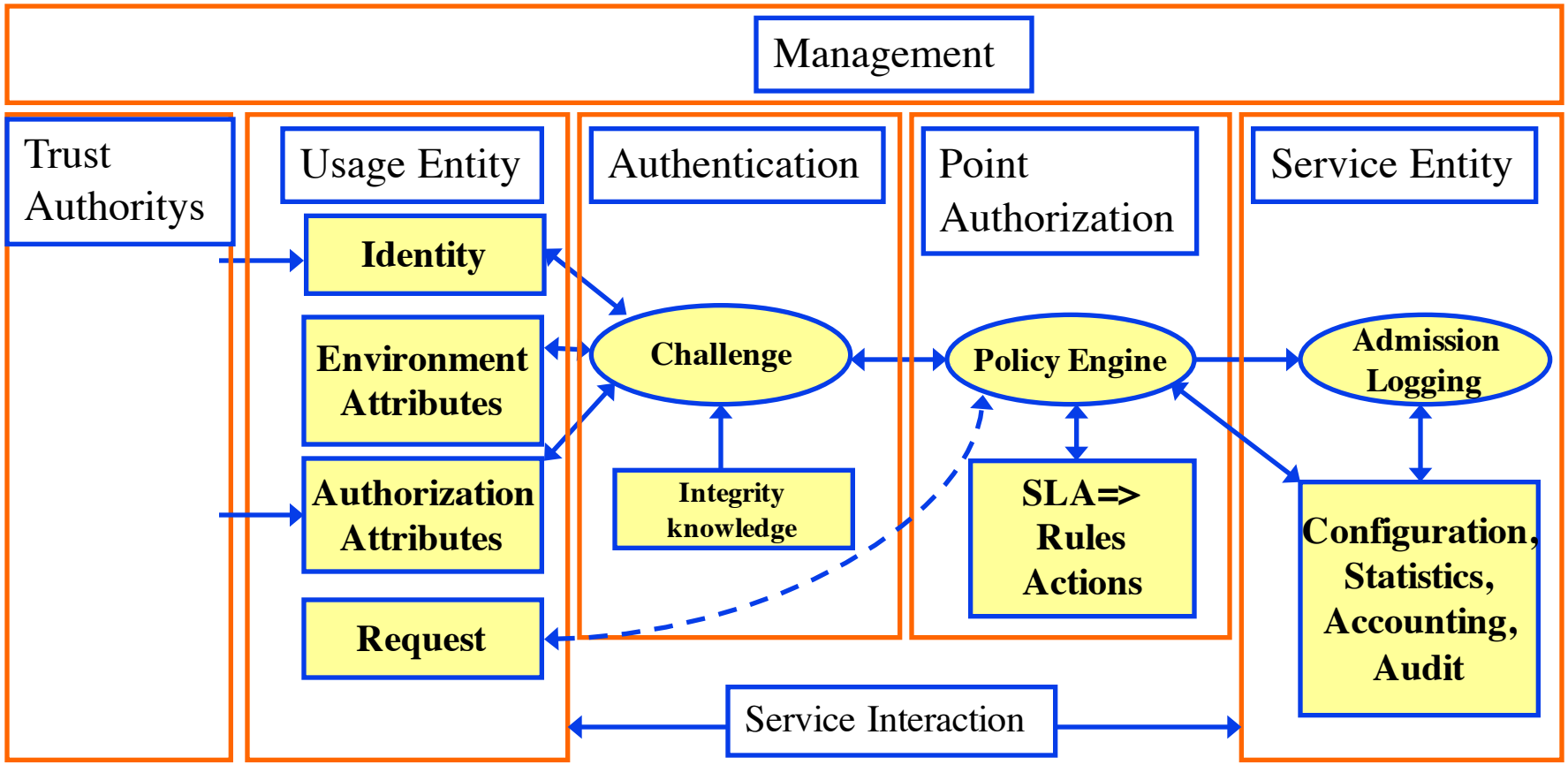
Cost model

- Networks are expensive resources
- Borrow from supercomputer era
- New unit: megabit/s kilometer second (mks)
  - Actually bit/s meter seconds (bps.ms => bm)
  - SURFnet has: 20 * 155 * 200 * 31536000 ≈ 1.9E13 mks
  - Dynacore needs: 1 * 20 * 400 * 80 * 8 * 3600 ≈ 1.8E10 mks
  - DAS needs: 24 * 10 * 100 * 50 * 24 * 3600 ≈ 1.0E11 mks
- Establish a program advisory commission
- Use ecash on virtual bank to account
- Use chipcards with certificates to do CAC

The need for policy control



Generic Service Access Model



High level model - 3rd iteration
Leon Gommans / Betty de Bruijn
1999-03-02

Current work in the IETF

- **Differentiated Services**
  - **IETF workgroup as part of transport area workgroup.**
  - **Charter: http://www.ietf.org/html.charters/diffserv-charter.html**
  - **Per Hop Behaviors (PHB), codepoints**
  - **AF - Assured forwarding = looks like ABR**
    4 classes with each 3 different levels of drop priority
  - **EF - Expedited forwarding = leased line behavior**
  - **Core on aggregated flows, shaping, metering, policing at boundarys**
- **Bandwidth Broker**
  - A bandwidth broker (BB) manages network resources for IP QoS services supported in the network and used by customers of the network services.
- **AAA**
  - **Authentication**
  - **Authorization**
  - **Accounting**
  - **Charter: http://www.ietf.org/html.charters/aaa-charter.html**

The three scenarios

- **Bureaucracy**
  - Long turnaround (rtt ≈ days)
  - Expensive rented lines system
  - Connection oriented service
- **Complexity**
  - Automatic call setup
  - Needs probably also bureaucracy
  - Connection less/oriented mix service
- **Throw Bandwidth at the problem**
  - Might go wrong at bottlenecks
  - Easiest solution (UBR)
  - Connection less service

Acknowledgments

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www.phys.uu.nl/~delaat
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QUESTIONS ?