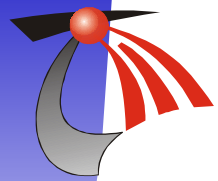

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INTERNET AND WEB DEVELOPMENTS

Aiko Pras

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

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

PRESENTATION AT CMG

NIEUWEGEIN, 14 MAY 2002

OVERVIEW

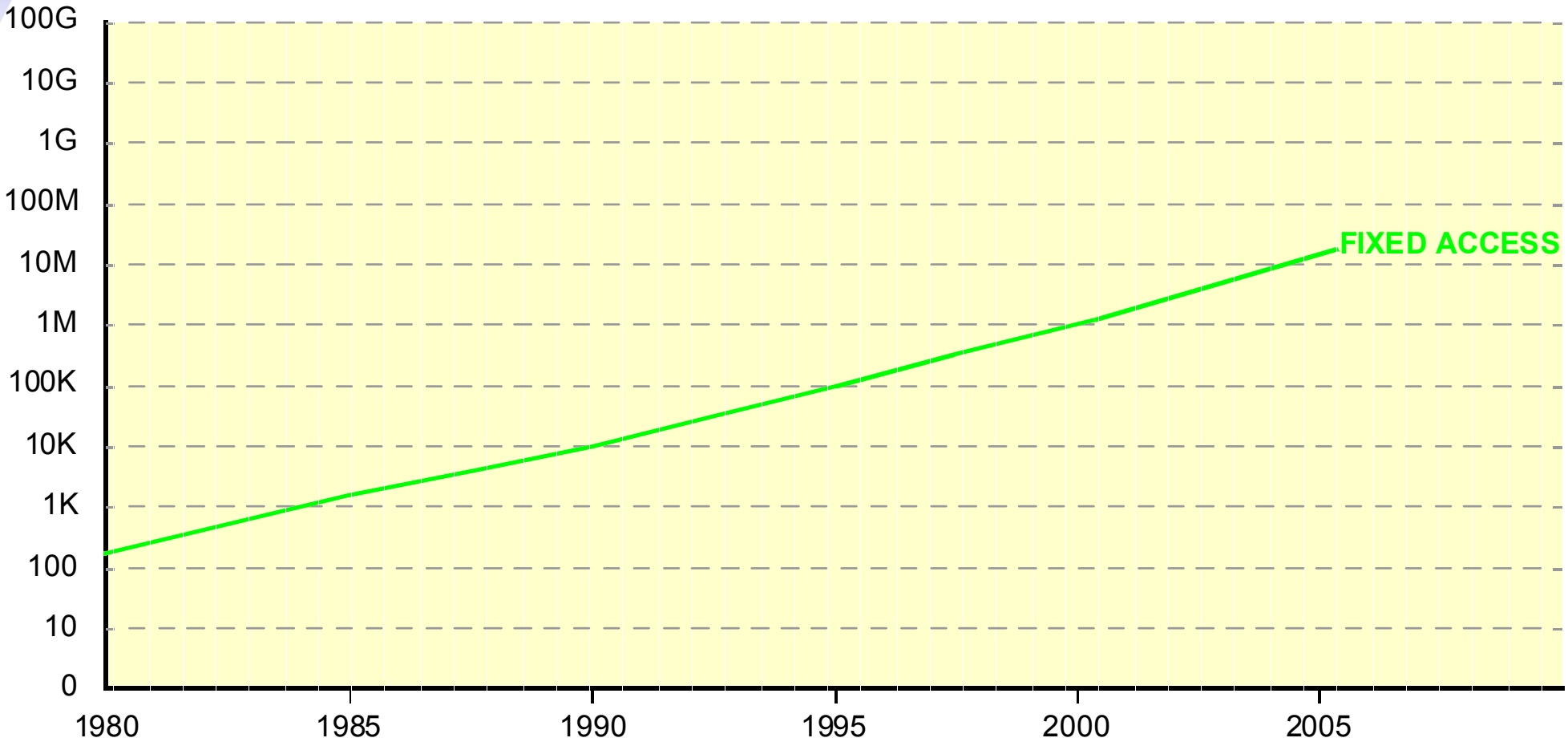
BANDWIDTH DEVELOPMENT

- WIRED
- WIRELESS
- COSTS

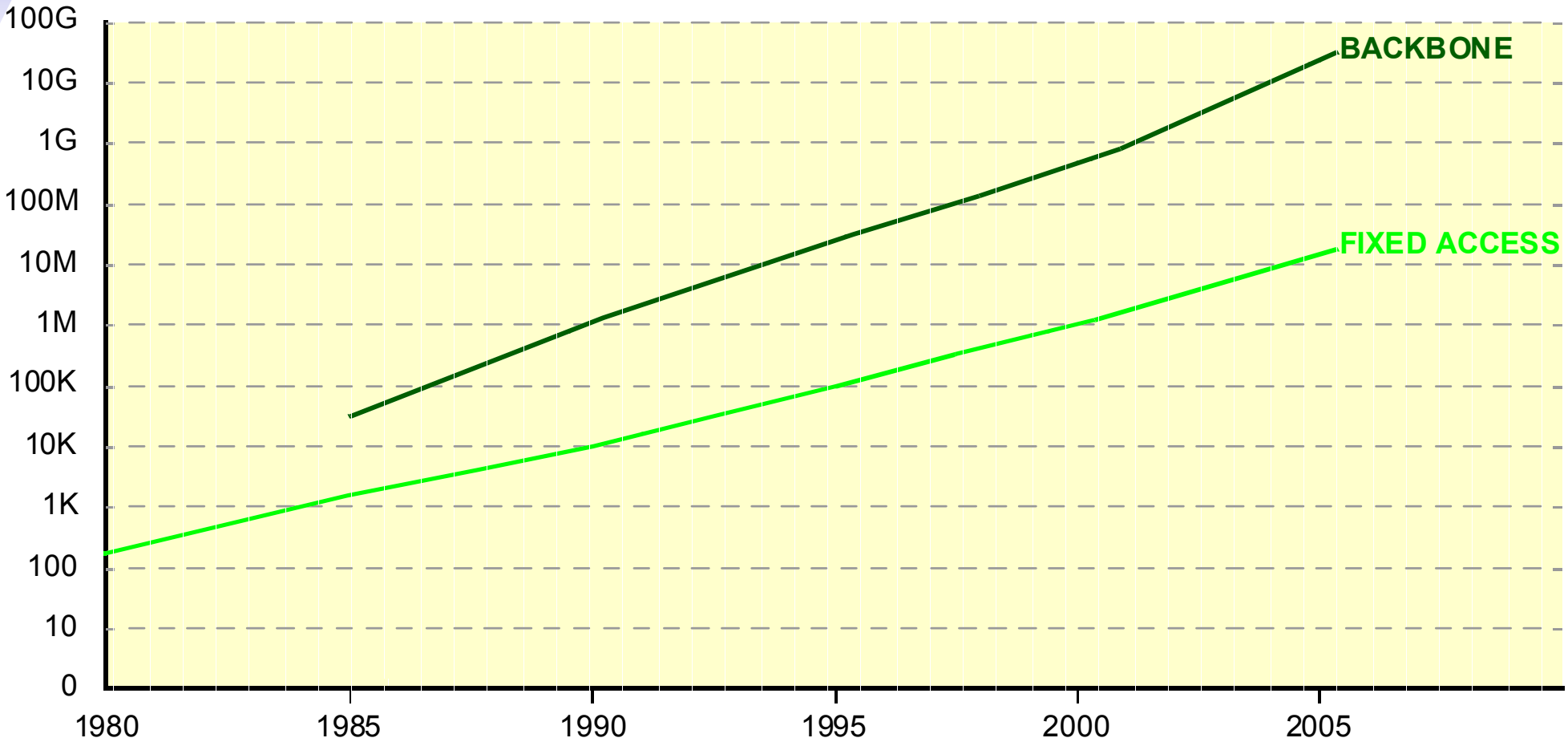
PROTOCOLS

- IP
- WEB SERVICES

BANDWIDTH - WIRED



BANDWIDTH - WIRED



BANDWIDTH - WIRED

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

DO WE NEED SO MUCH BANDWIDTH?

LETS TAKE A LOOK AT THE CAMPUS-NET OF THE UNIVERSITY OF TWENTE

- **2000 USERS**
- **100 Mbps ACCESS**

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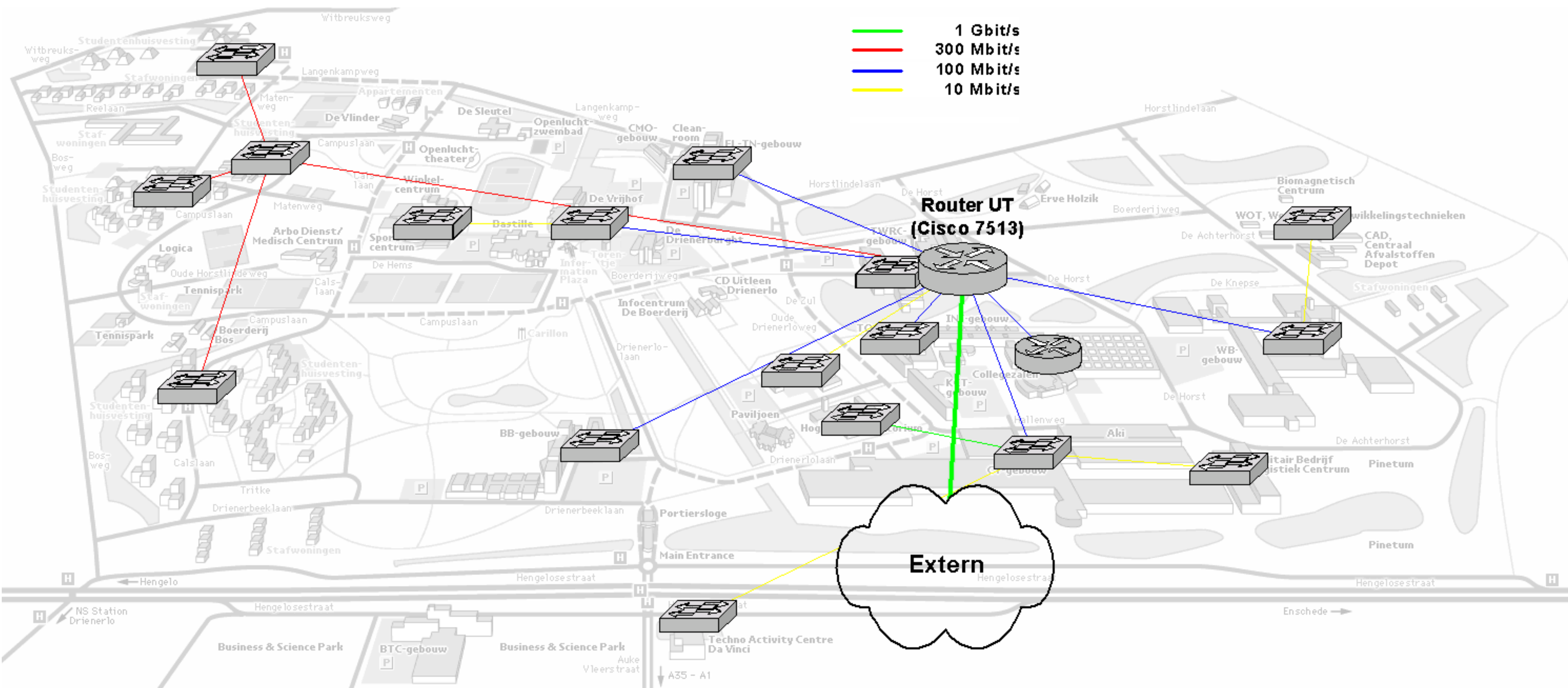
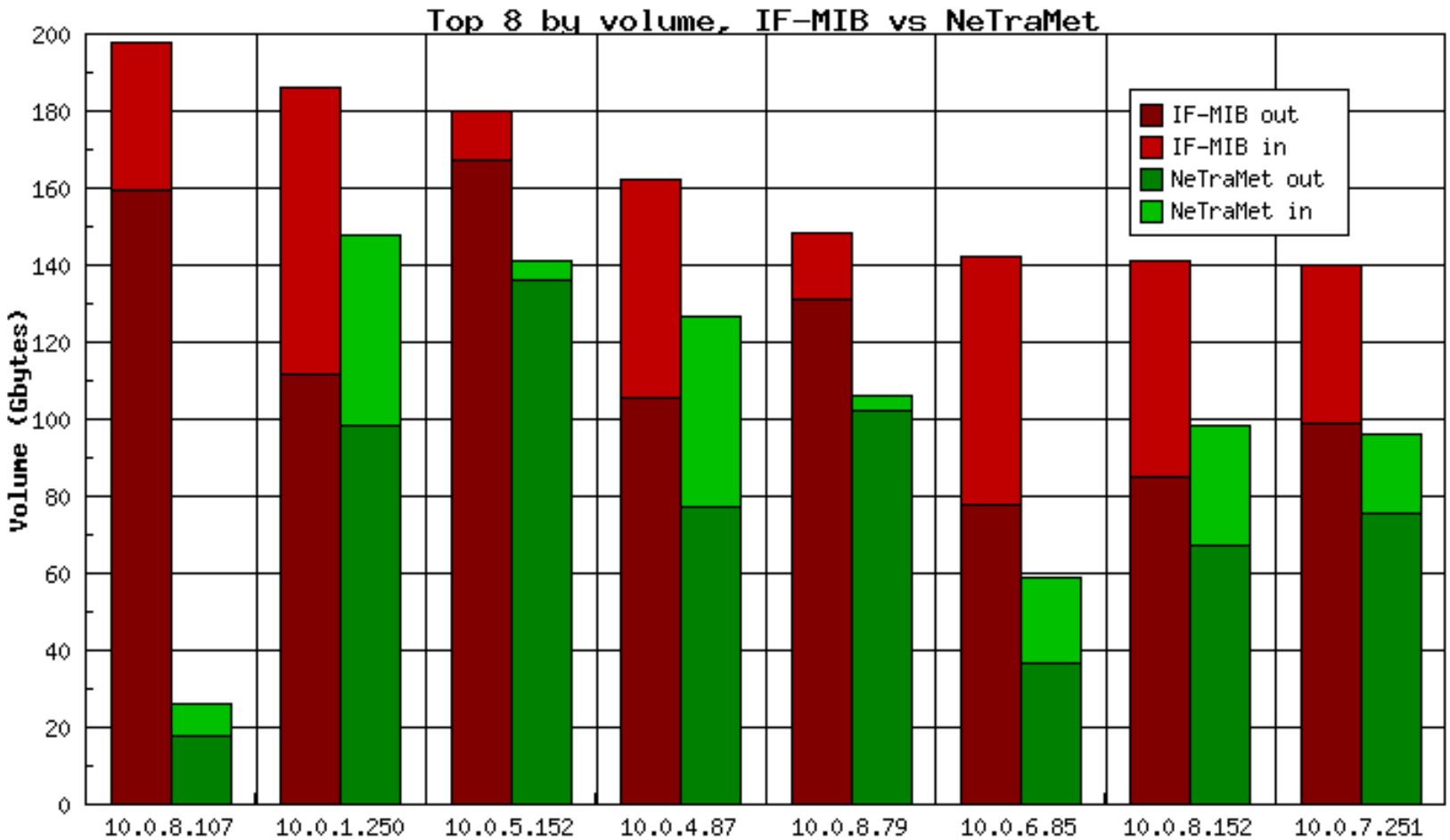
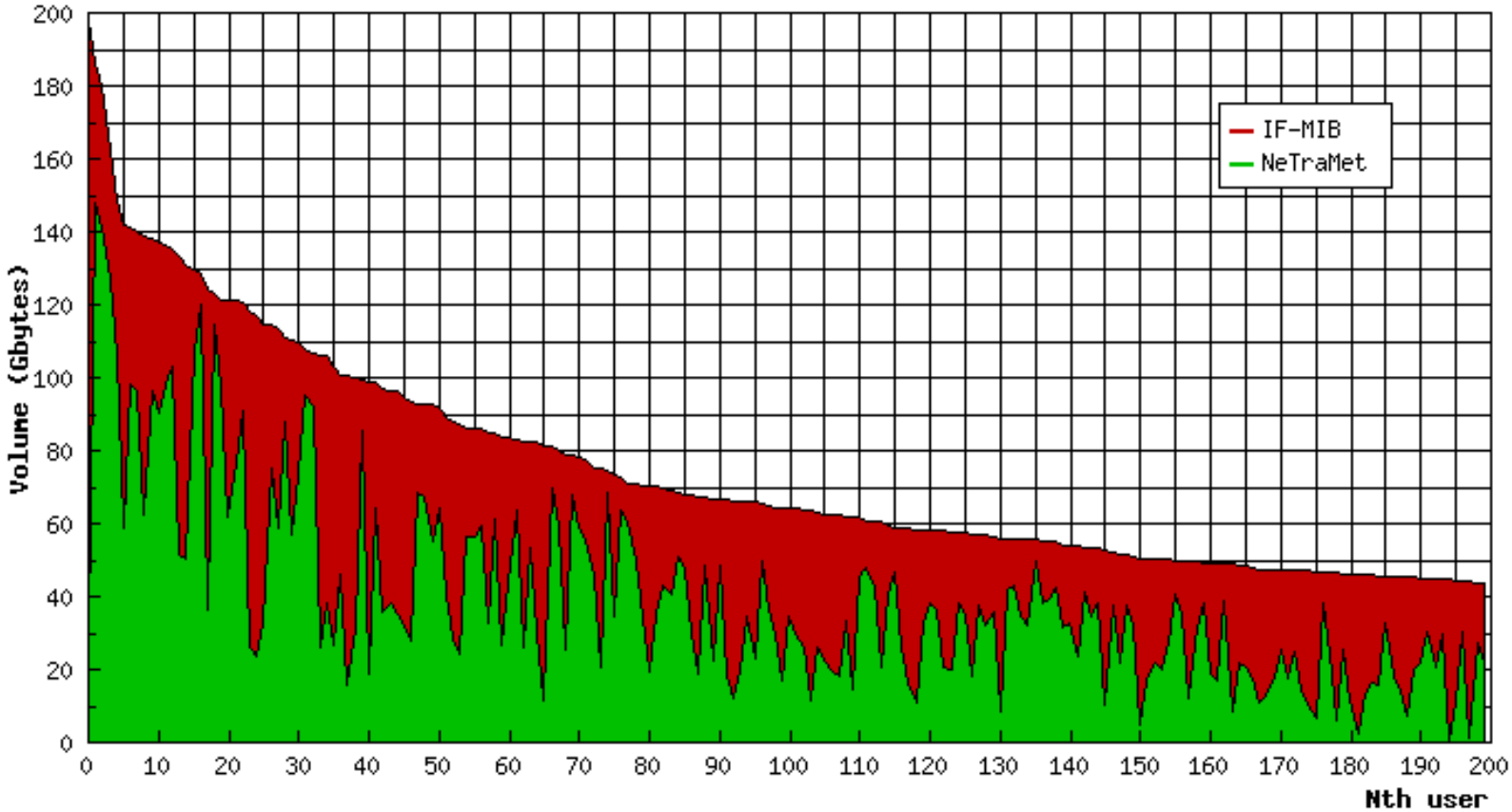
CAMPUS-NET



CAMPUS-NET


Top 8 by volume, IF-MIB vs NeTraMet
Volume (Gbytes)
0
20
40
60
80
100
120
140
160
180
200
IF-MIB out
IF-MIB in
NeTraMet out
NeTraMet in
10.0.8.107
10.0.1.250
10.0.5.152
10.0.4.87
10.0.8.79
10.0.6.85
10.0.8.152
10.0.7.251

CAMPUS-NET


IF-MIB
NeTraMet
Volume (Gbytes)
Nth user
0
20
40
60
80
100
120
140
160
180
200
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200

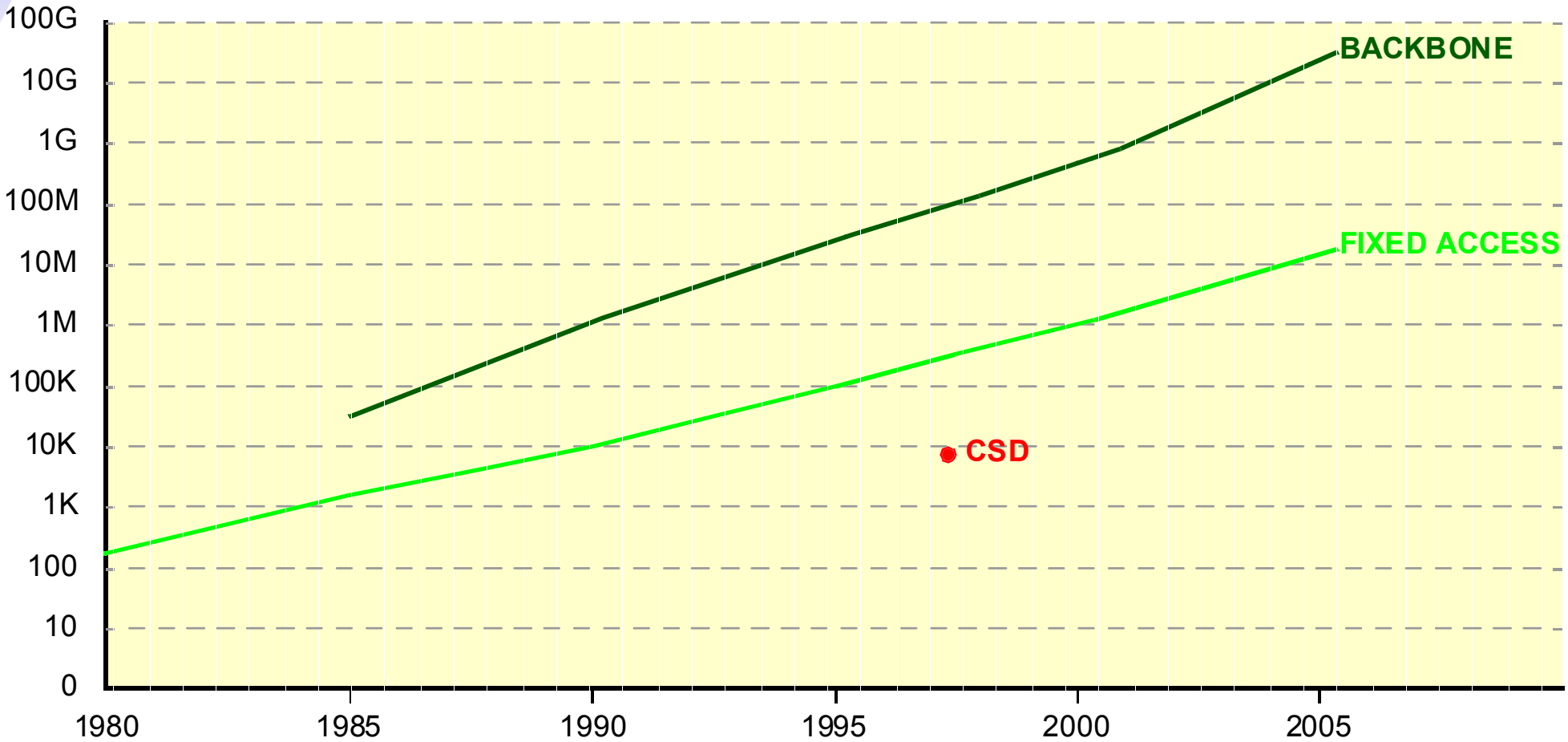
INTERMEDIATE CONCLUSION

POTENTIAL BANDWIDTH CONSUMPTION HIGHER THEN MANY PEOPLE EXPECT

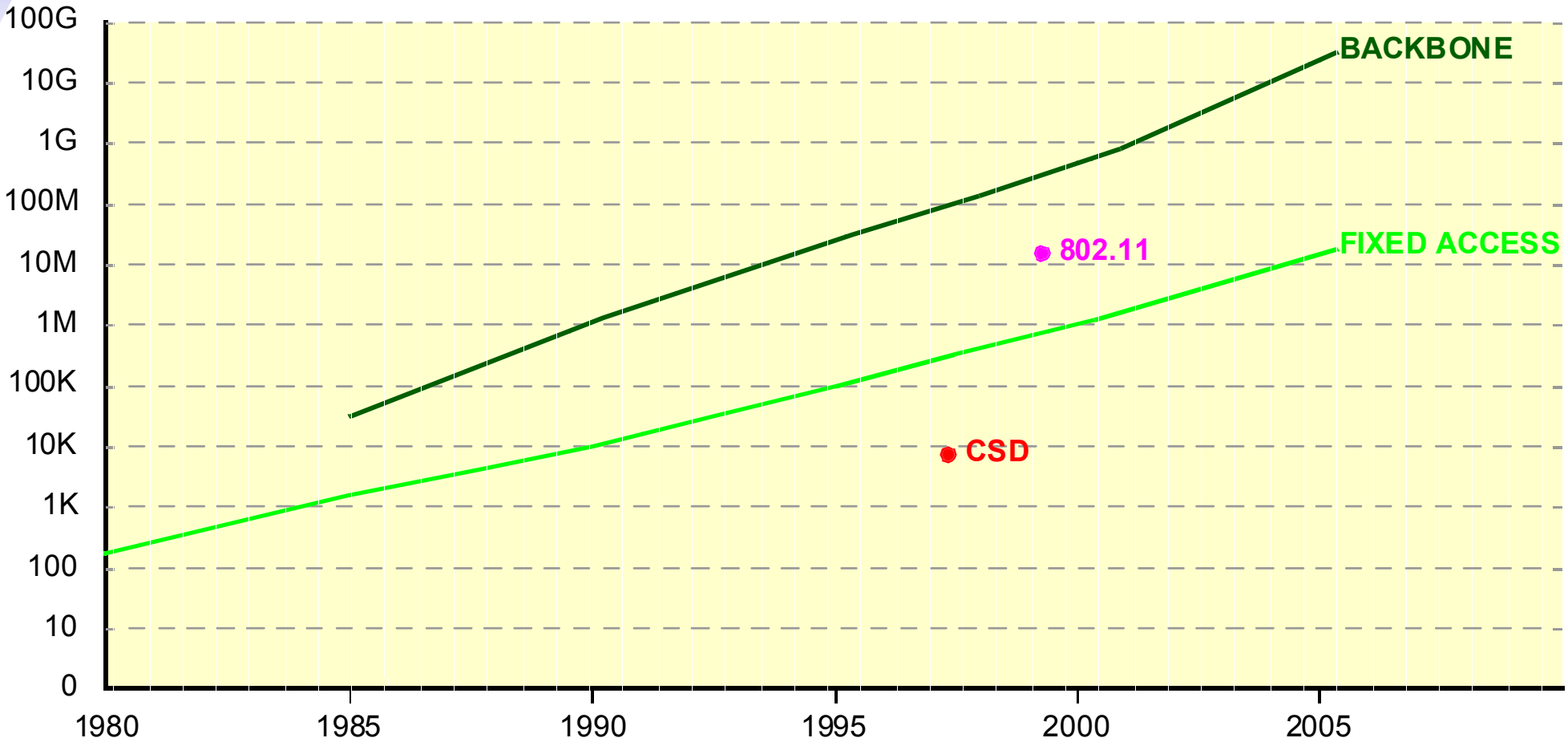
50 GB / WEEK NOT UNREALISTIC

WHAT WOULD HAPPEN WITHOUT UT POLICY TO LIMIT BANDWIDTH?

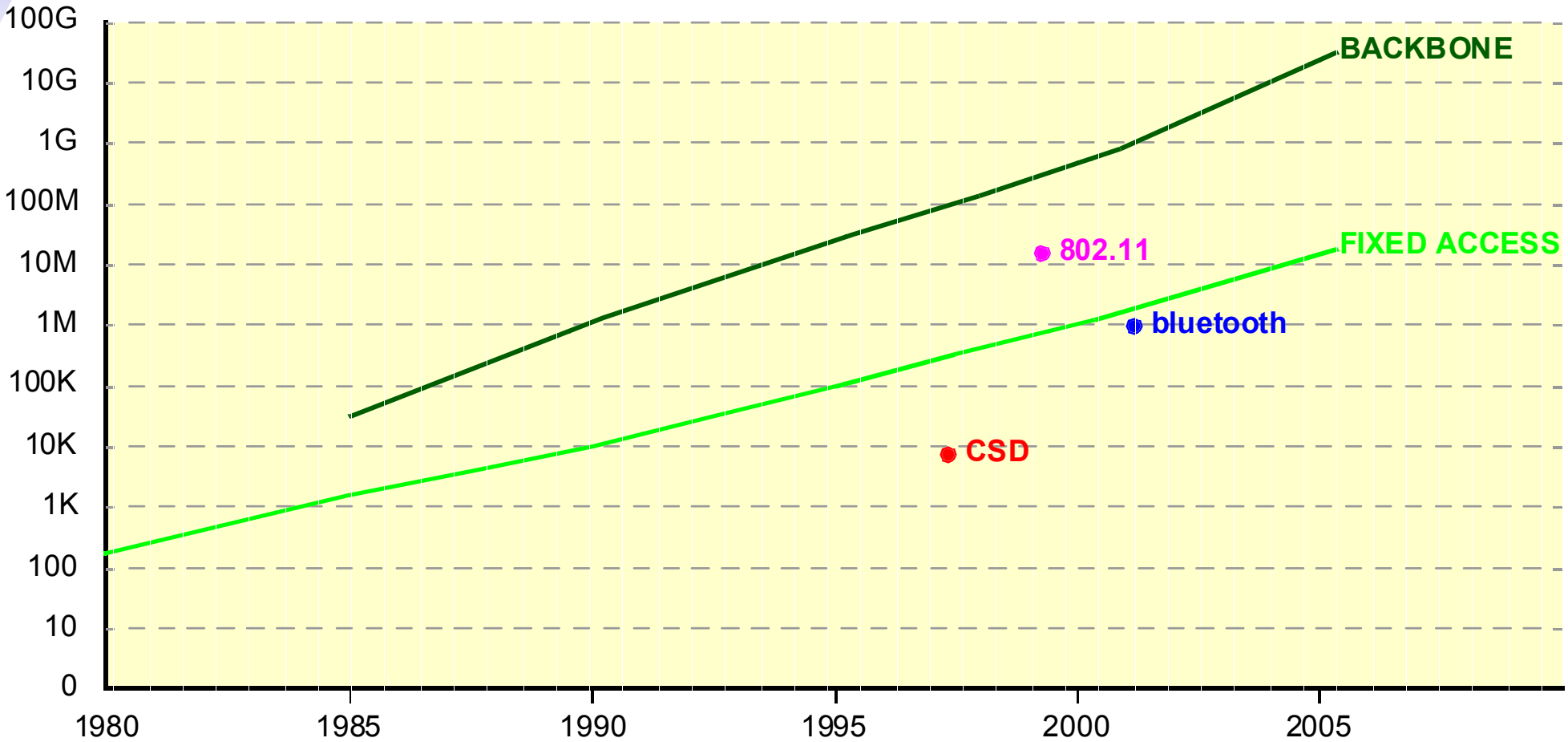
BANDWIDTH - WIRELESS



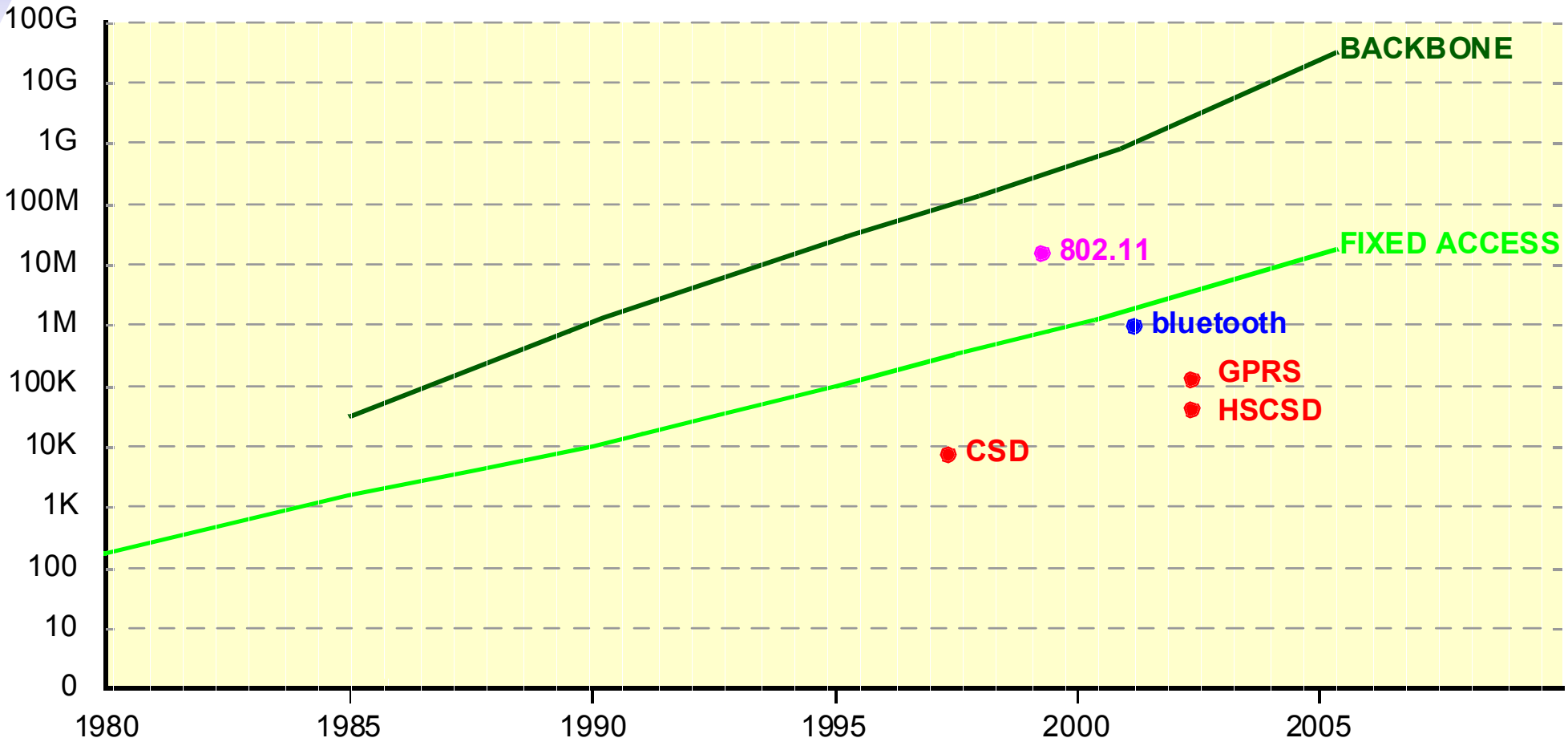
BANDWIDTH - WIRELESS



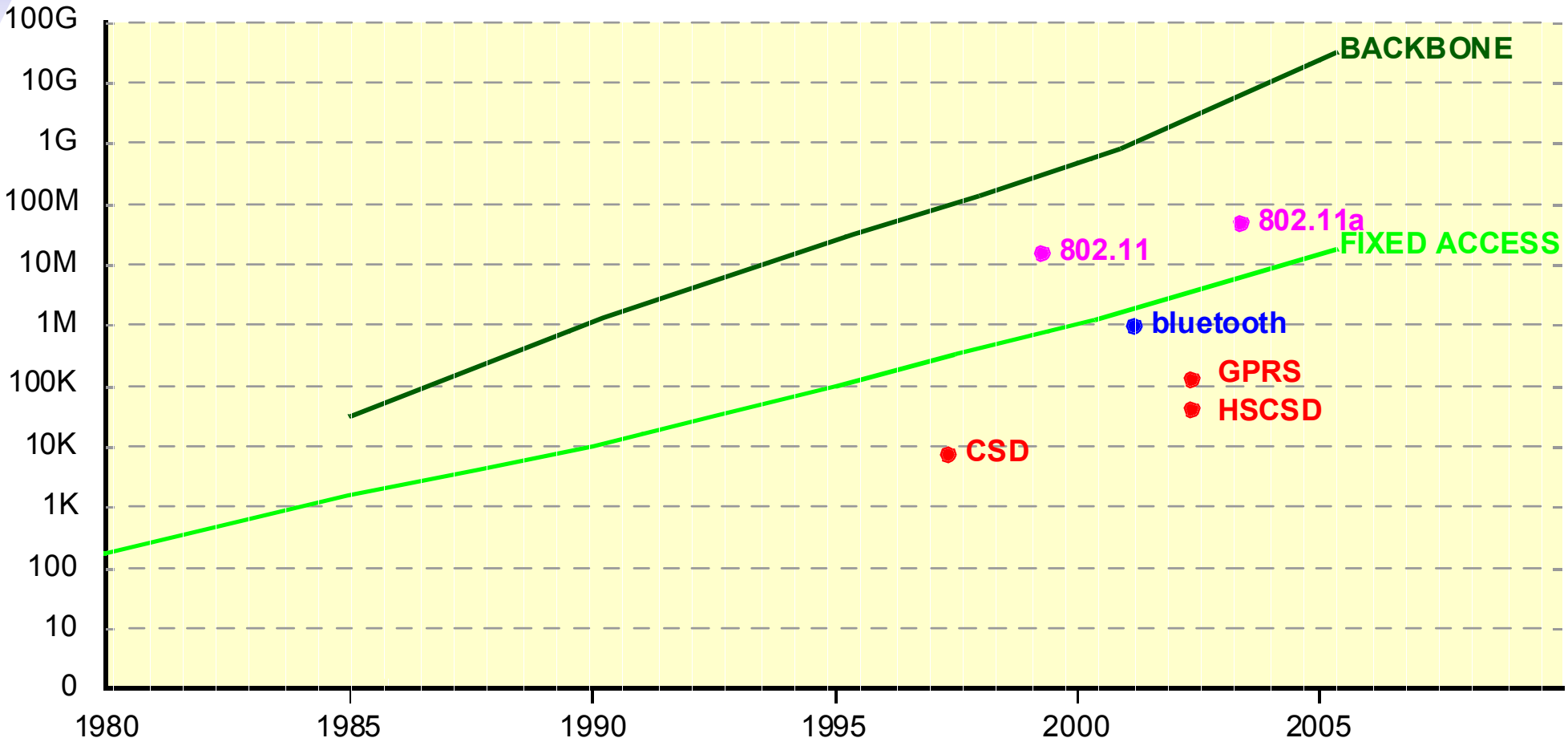
BANDWIDTH - WIRELESS



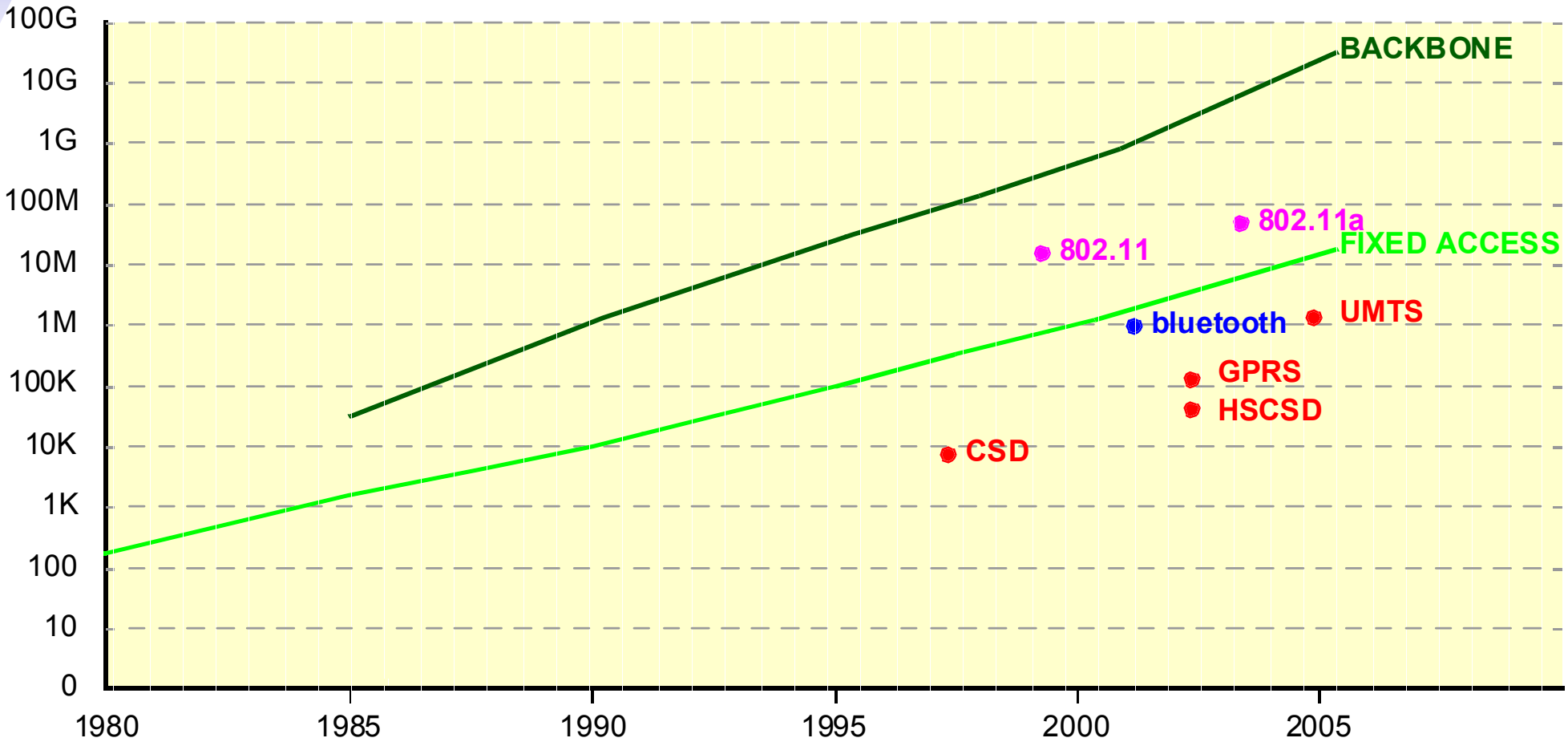
BANDWIDTH - WIRELESS



BANDWIDTH - WIRELESS



BANDWIDTH - WIRELESS



WIRELESS - 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

WIRELESS - COSTS GPRS

COSTS OF COPYING 1 CD
(600 MB)

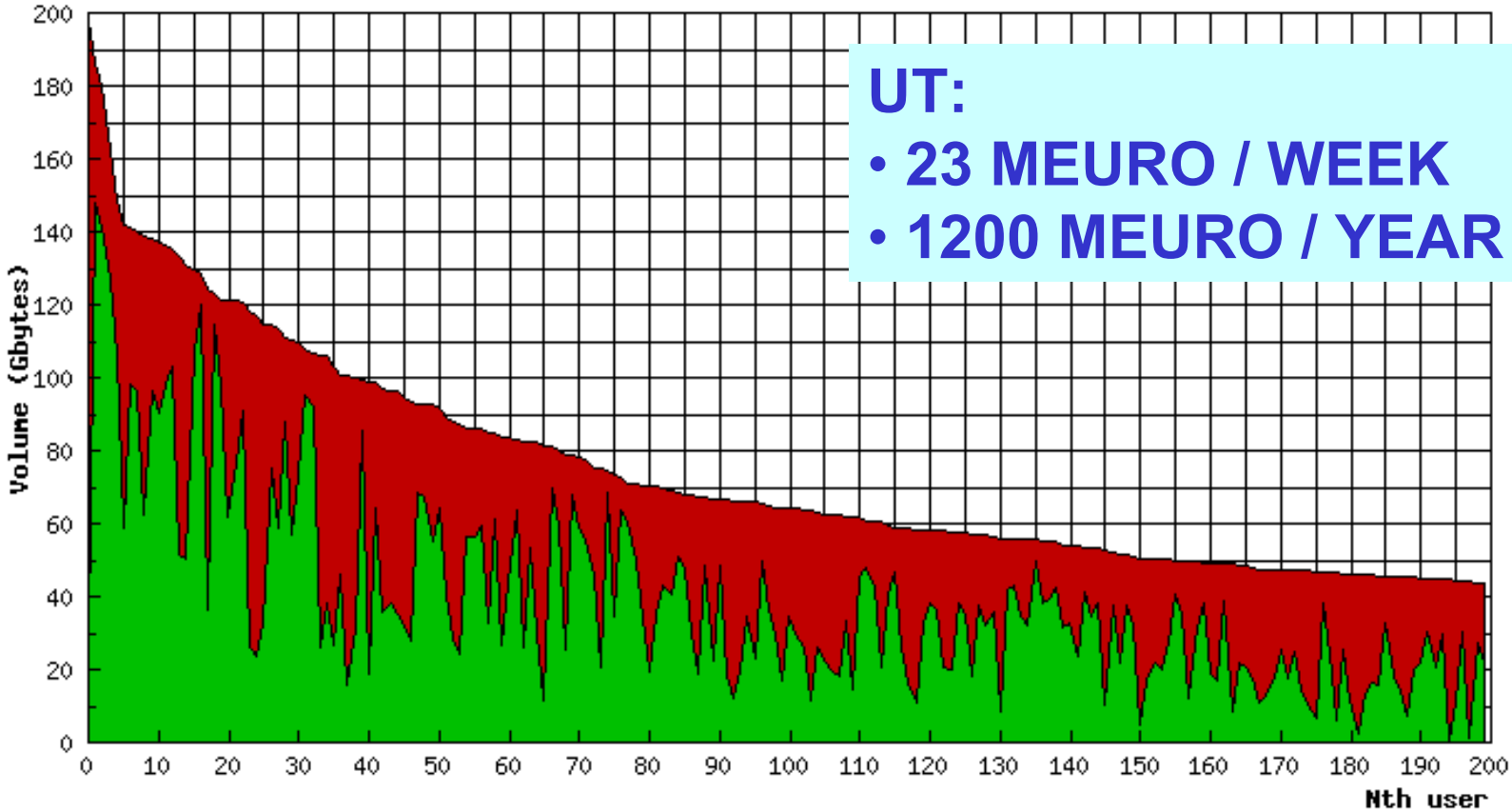
900 EURO

DOWNLOAD TIME: 13 HOURS

CAMPUS-NET

Top 8 by volume, IF-MIB vs NeTraMet
Volume (Gbytes)
0
20
40
60
80
100
120
140
10.0.8.107
10.0.1.250
10.0.5.152
10.0.4.87
10.0.8.79
10.0.6.85
10.0.8.152
10.0.7.251

CAMPUS-NET



UT:

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

INTERMEDIATE CONCLUSION

- **GPRS / UMTS**

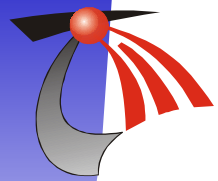
WILL BE EXPENSIVE (UNDER-STATEMENT)

- **GPRS / UMTS**

WILL NOT REPLACE FIXED INFRASTRUCTURE

- **FOR WIRELESS**

WE WILL HAVE IEEE802.11 HOTSPOTS



WHAT ABOUT PROTOCOLS

AT NETWORK LAYER:

- IP (v4/v6)

ABOVE NETWORK LAYER (MIDDLEWARE):

- *WEB PROTOCOLS*
- STREAMING PROTOCOLS
- …

WEB PROTOCOLS - DEVELOPMENTS

PHASE 1: HTTP+HTML

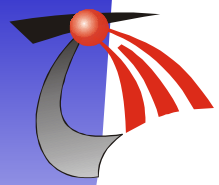
- CLIENT IS HUMAN BEING
- ONE WAY COMMUNICATION (FROM SERVER TO CLIENT)

PHASE 2: HTTP+XML

- CLIENT CAN BE HUMAN BEING OR PIECE OF SOFTWARE
- ONE WAY COMMUNICATION (FROM SERVER TO CLIENT)

PHASE 3: HTTP+XML+SOAP+WSDL+UDDI

- CLIENT CAN BE HUMAN BEING OR PIECE OF SOFTWARE
- TWO WAY COMMUNICATION
- WEB SERVICES



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WEB SERVICES

W3C STANDARDS

SHIP DATA – NO CODE

RPC

SUPPORTED BY ALL MAJOR VENDORS

MICROSOFT, SUN, IBM, APACHE, …

WEB SERVICES

VISION:
TECHNOLOGY BECOMES PART OF OFFICE PLATFORMS

DATABASES

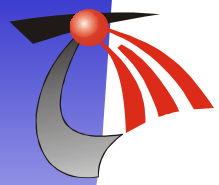
- FETCH PERIODICALLY VALUES FROM REMOTE WEB SERVERS

SPREADSHEETS

- CELLS REPRESENT VALUES ON REMOTE WEB SERVERS

TEXT PROCESSORS

- TEXT INCLUDES DATA FROM REMOTE WEB SERVERS



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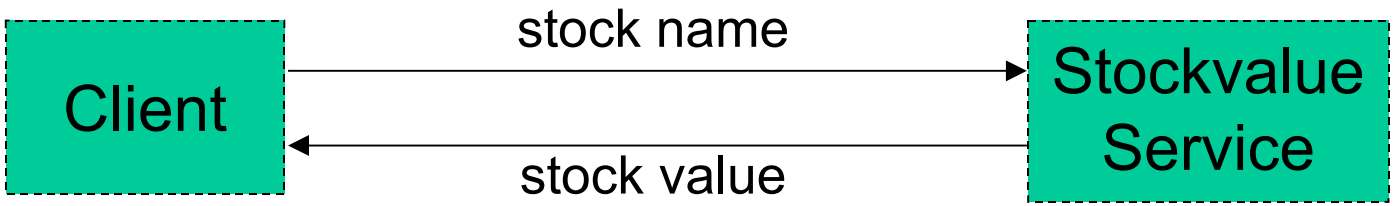
WEB SERVICES - SOAP

SIMPLE OBJECT ACCESS PROTOCOL

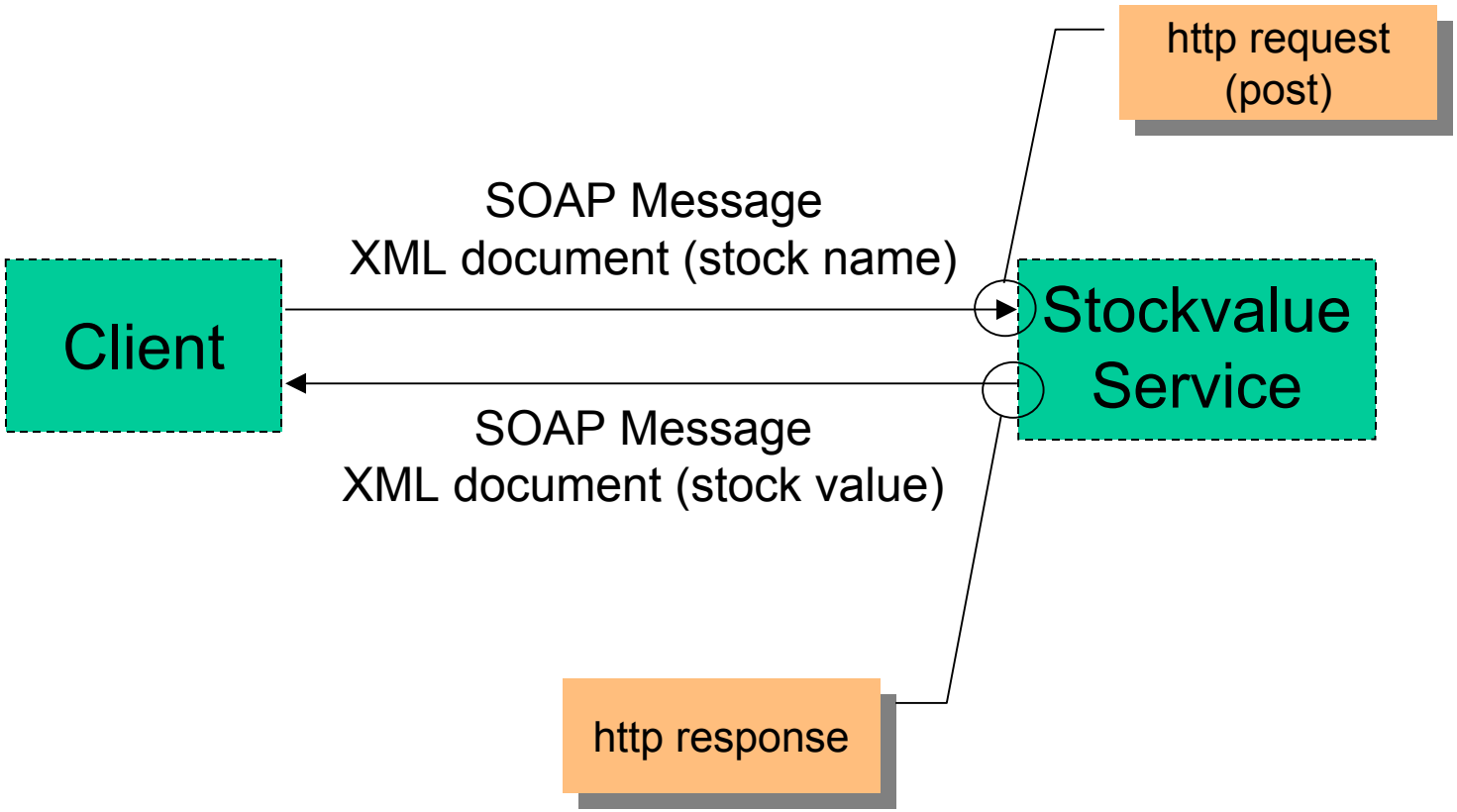
“A lightweight and simple XML-based protocol to allow the exchange of structured and typed information across the Web” [SOAP]

LAYER ON TOP OF HTTP

WEB SERVICES - SOAP EXAMPLE



WEB SERVICES - SOAP EXAMPLE



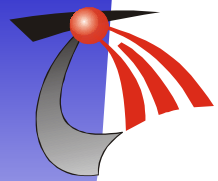
WEB SERVICES - SOAP EXAMPLE

REQUEST:

```
<soap:Envelope>
   <soap:Body xmlns:m="http://www.stock.org/stock" />
        <m:GetStockPrice>
          <m:StockName>IBM</m:StockName>
        </m:GetStockPrice>
   </soap:Body>
</soap:Envelope>
```

RESPONSE:

```
<soap:Envelope>
   <soap:Body xmlns:m="http://www.stock.org/stock" />
        <m:GetStockPriceResponse>
          <m:Price>34.5</m:Price>
        </m:GetStockPriceResponse>
   </soap:Body>
</soap:Envelope>
```



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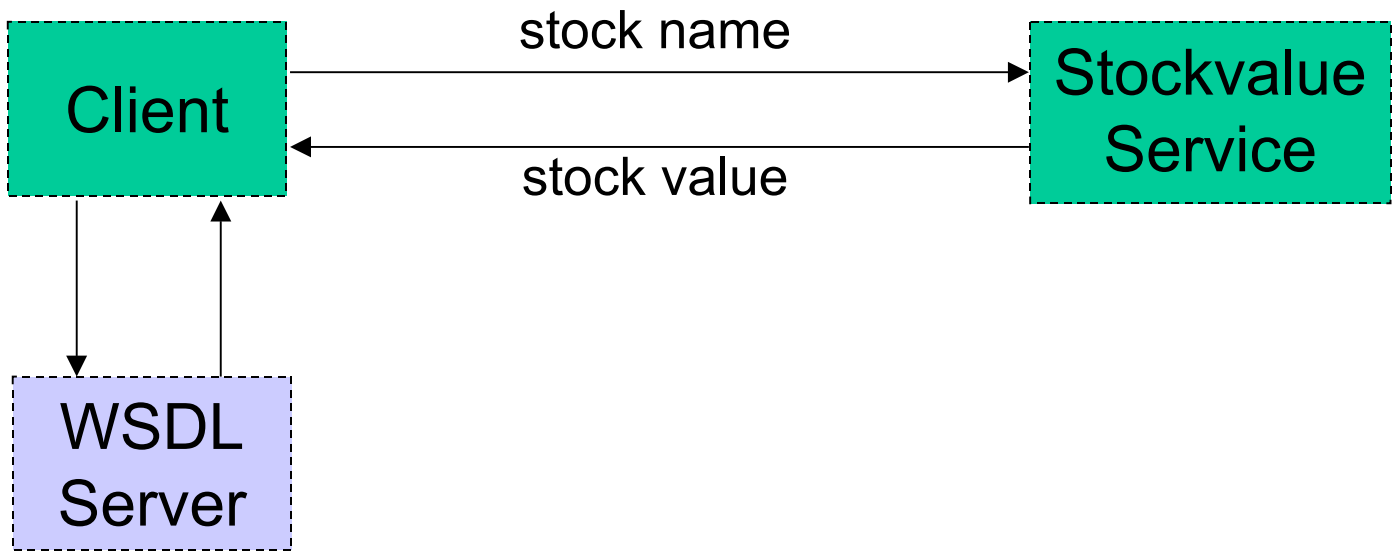
WEB SERVICES - WSDL

WEB SERVICE DESCRIPTION LANGUAGE

“an XML format for describing network services as a set of endpoints operating on messages containing either document-oriented or procedure-oriented information.” [WSDL]

USEFUL FOR DEVELOPERS AS WELL AS APPLICATIONS

WEB SERVICES - WSDL EXAMPLE



WEB SERVICES - WSDL

TYPES: a container for data type definitions using some type system

MESSAGE: an abstract, typed definition of the data being communicated.

OPERATION: an abstract description of an action supported by the service.

PORT TYPE: an abstract set of operations supported by one or more endpoints.

BINDING: a concrete protocol and data format specification for a particular port type.

PORT: a single endpoint defined as a combination of a binding and a network address.

SERVICE: a collection of related endpoints.

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WEB SERVICES - UDDI

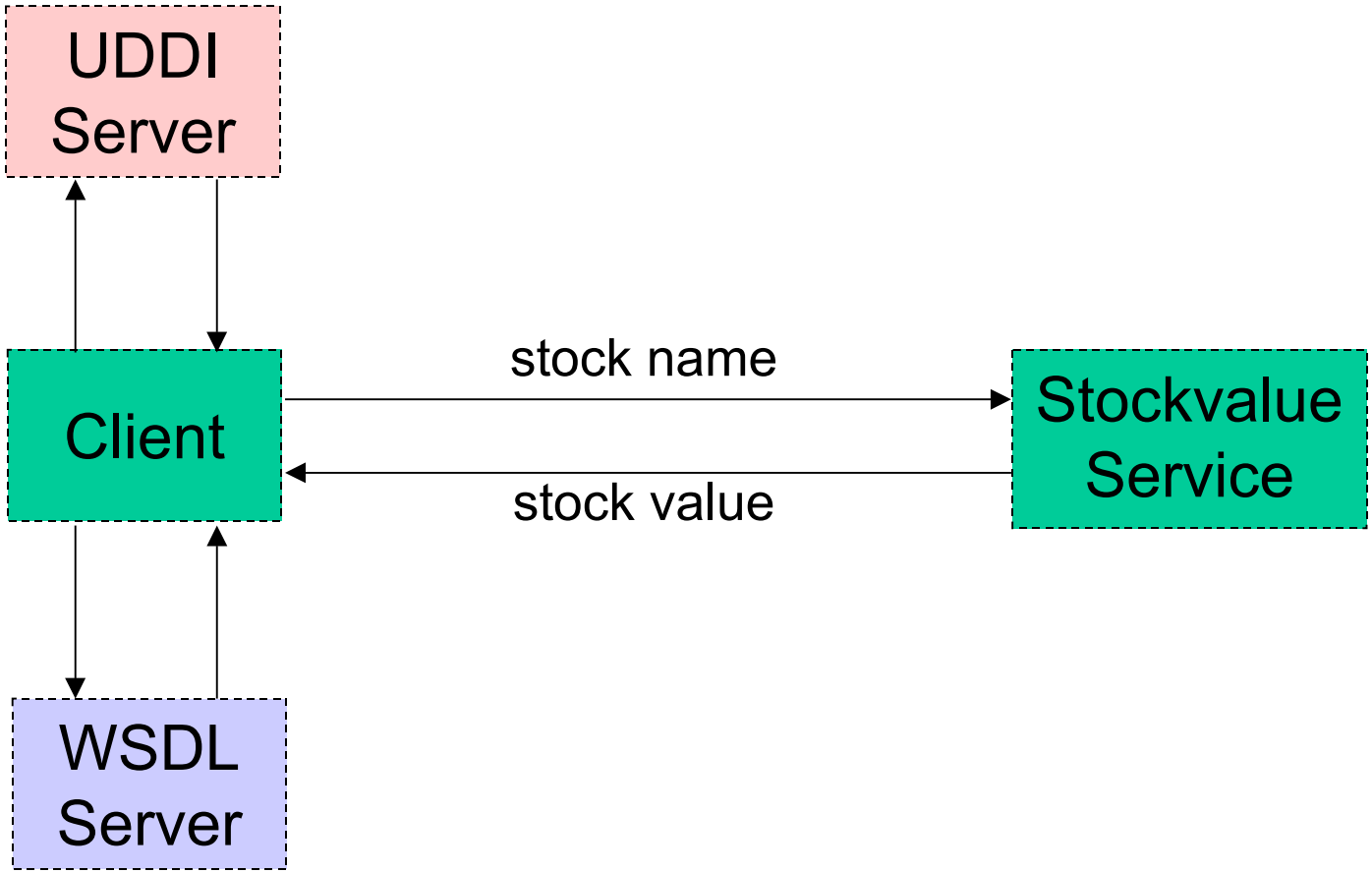
UNIVERSAL DESCRIPTION, DISCOVERY AND INTEGRATION

DIRECTORY WITH:
- INFORMATION ON WEB SERVICES
- WSDL DOCUMENTS

ACCESS VIA SOAP

USEFUL FOR END USERS

WEB SERVICES - UDDI EXAMPLE



WEB SERVICES: SOME PROBLEMS

ACCESS CONTROL TO WEB SERVICES

(PASSPORT, LIBERTY ALLIANCE)

LACK OF TRANSACTIONS

PERFORMANCE:

- SPEED OF PARSING
- CACHING OF WSDL DATA

CONCLUSIONS

POTENTIAL BANDWIDTH CONSUMPTION HIGHER THEN MANY ENVISAGE

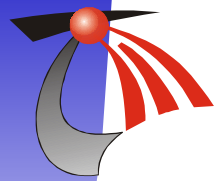
GPRS EXPENSIVE

WIRELESS WILL NOT REPLACE WIRED ACCESS

IP WILL BE THE MAIN NETWORK PROTOCOL

ON TOP OF IP, WEB SERVICES SEEM TO BECOME THE MIDDLEWARE TECHNOLOGY OF CHOICE

WEB SERVICE TECHNOLOGY STILL UNDER DEVELOPMENT



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SOME PROJECT IDEAS

STARTING POINT:
THERE WILL BE A MIXTURE OF NETWORKS

UMTS PROVIDER A

FIXED PROVIDER A

FIXED PROVIDER B

802.11 PROVIDER C

THE PROBLEM IS NOW ...

HOW TO CONTROL THE COOPERATION BETWEEN THESE NETWORKS?

- **QoS "GUARANTEES"**

END-TO-END MECHANISMS ARE TECHNICALLY NOT FEASABLE

- **ACCOUNTING**

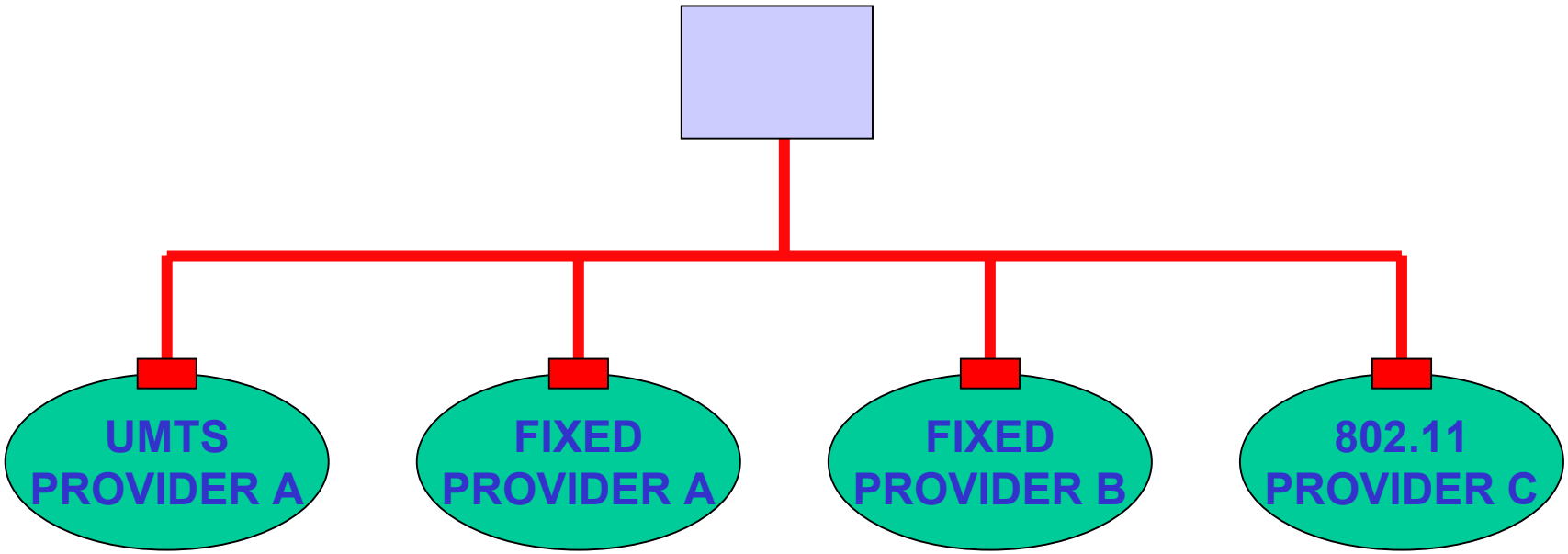
STANDARDIZATION BODIES WILL NOT AGREE ON A SINGLE MECHANISM

- **SECURITY**

PROVIDERS WILL SELECT DIFFERENT OPTIONS

THE SOLUTION IS ...

CREATE OPEN CONTROL INTERFACES



APPROACHES THUSFAR

TINA & CORBA (OMG)

OSA (3GPP)

PARLAY

CMIP/CMIS/GDMO/… (ISO)

SNMP (IETF)

C7 (ITU)

THESE APPROACHES WON'T WORK

OFTEN TOO COMPLEX

SOLUTIONS FOR SPECIFIC TECHNOLOGIES

NO ONE ACCEPTABLE FOR ALL

- TINA/CORBA FOR CONTROLLING IP TECHNOLOGY?
- PARLAY/OSA FOR CONTROLLING IP TECHNOLOGY?

WHICH APPROACH COULD WORK?

- SIMPLE TO UNDERSTAND
- SIMPLE TO IMPLEMENT
- UBIQUITY

WEB SERVICES