3th Lambda Workshop

Reykjavík 27 august 2003

[K,C]ees

Many many thanks to our host NORDUnet and Peter Villemoes!

SURFnet

DataTAG

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

www.science.uva.nl/~delaat

Faculty of Science

History

- Brainstorming in Antalya at Terena conf. 2001
- 1th meeting at Terena offices 11-12 sep 2001
  - On invitation only (15) + public part
  - Thinking, SURFnet test lambda Starlight-Netherlight
- 2nd meeting appended to iGrid 2002 in Amsterdam
  - Public part in track, on invitation only day (22)
  - Core testbed brainstorming, idea checks, seeds for Translight
- 3th meeting here
  - Grid/Lambda track in conference + this meeting (35!)
  - Brainstorm applications and showcases
  - Technology roadmap

eVLBI

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

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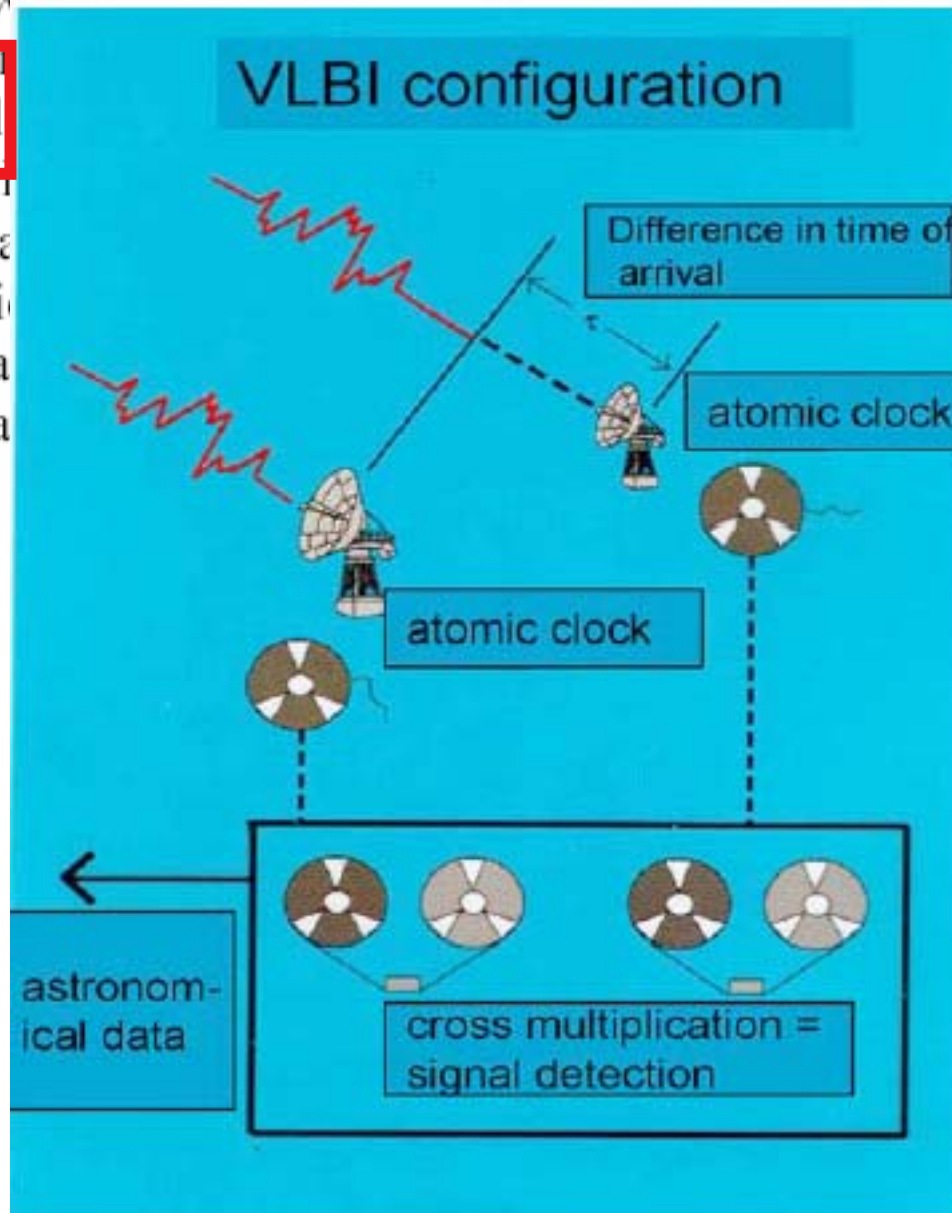
VLBI

ger term VLBI is easily capable of generating many Gb of data per
The sensitivity of the VLBI array scales w
(=data-rate) and there is a strong push to
Rates of 8Gb/s or more are entirely feasibl
der development. It is expected that parall
orrelator will remain the most efficient approa
s distributed processing may have an appli
lti-gigabit data streams will aggregate into la
or and the capacity of the final link to the da
tor.

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.



iGrid 2002

September 24-26, 2002, Amsterdam, The Netherlands

- 28 demonstrations from 16 countries: Australia, Canada, CERN, France, Finland, Germany, Greece, Italy, Japan, The Netherlands, Singapore, Spain, Sweden, Taiwan, United Kingdom, United States
- Applications demonstrated: art, bioinformatics, chemistry, cosmology, cultural heritage, education, high-definition media streaming, manufacturing, medicine, neuroscience, physics, tele-science

- Grid technologies demonstrated: Major emphasis on grid middleware, data management grids, data replication grids, visualization grids, data/visualization grids, computational grids, access grids, grid portals
- 25Gb transatlantic bandwidth (100Mb/attendee, 250x iGrid2000!)

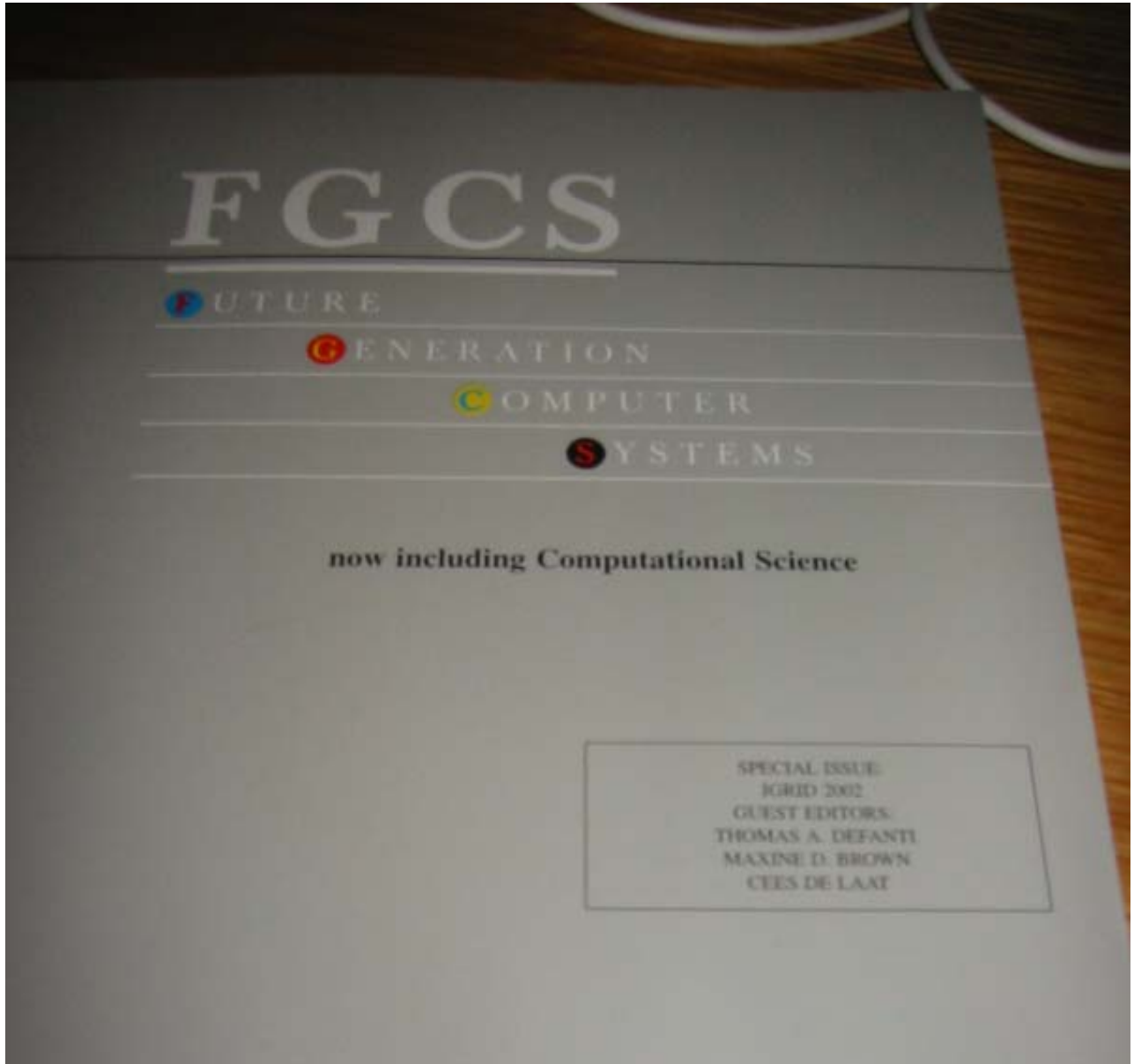
www.igrid2002.org

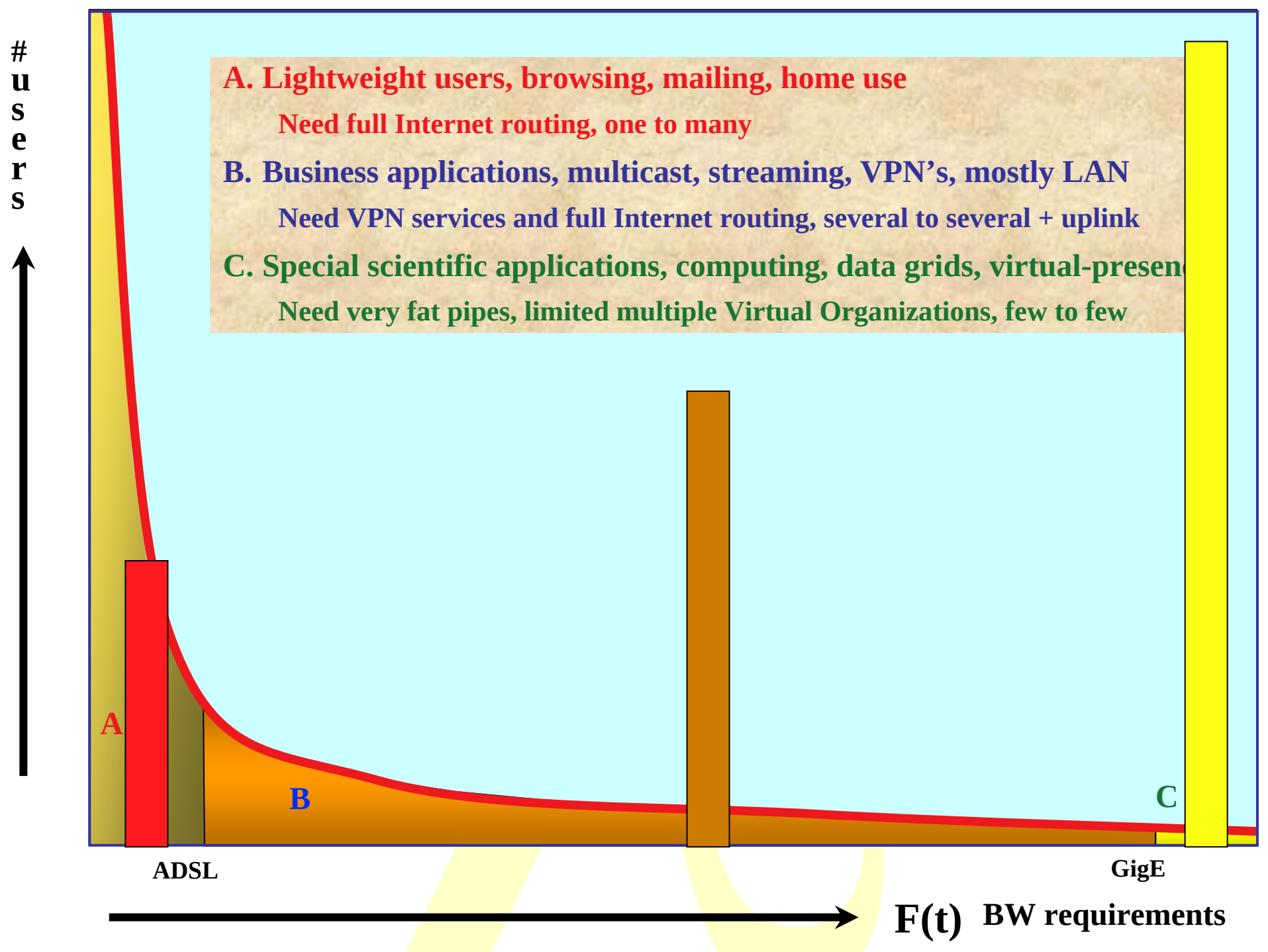
iGrid 2002

September 24-26, 2002, Amsterdam, The Netherlands

Conference issue
FGCS
Volume 19 (2003)
Number 6 august
22 refereed papers!

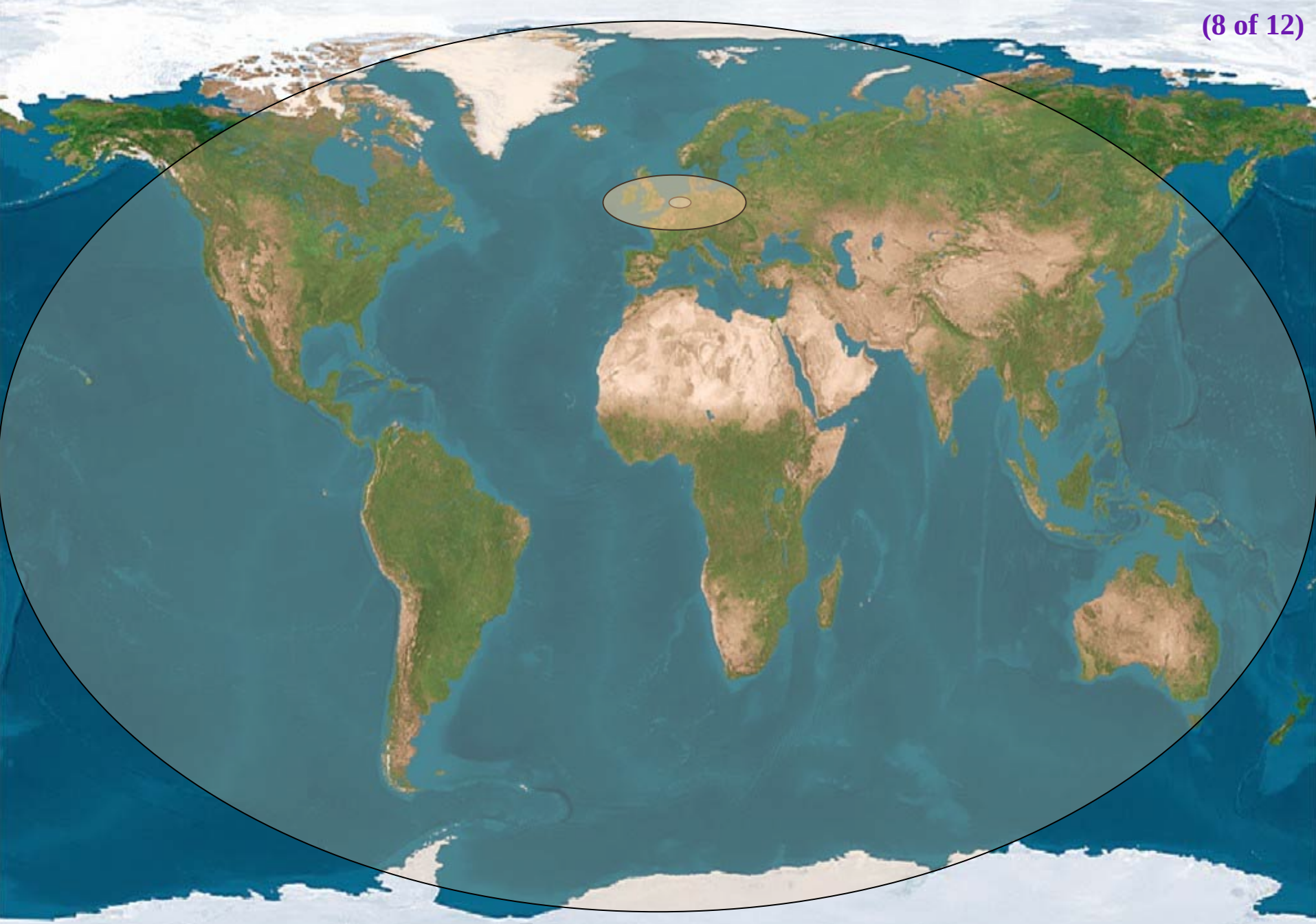
THESE
ARE
THE
APPLICATIONS!




#users
A. Lightweight users, browsing, mailing, home use
Need full Internet routing, one to many
B. Business applications, multicast, streaming, VPN's, mostly LAN
Need VPN services and full Internet routing, several to several + uplink
C. Special scientific applications, computing, data grids, virtual-presen
Need very fat pipes, limited multiple Virtual Organizations, few to few
A
B
C
ADSL
GigE
F(t) BW requirements

The Dutch Situation

- **Estimate A**
  - **17 M people, 6.4 M households, 25 % penetration of 0.5 Mb/s ADSL, 40 times under-provisioning ==> 20 Gb/s**
- **Estimate B**
  - **SURFnet has 10 Gb/s to about 12 institutes and 0.1 to 1 Gb/s to 180 customers, estimate same for industry (overestimation) ==> 20-40 Gb/s**
- **Estimate C**
  - **Leading HEF and ASTRO + rest ==> 80-120 Gb/s**
- **So it fits nicely!**



Scale 2-20-200

Services

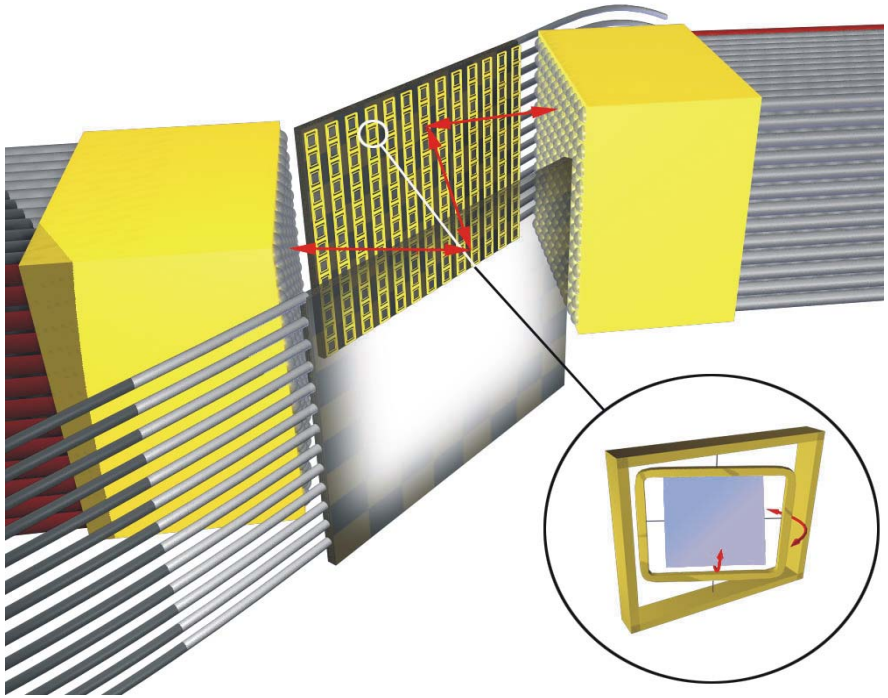
SCALE / CLASS	2 Metro	20 National/ regional	200 World
A	**Switching/ routing**	**Routing**	**ROUTER$**
B	**VPN's, Switching (G)MPLS**	**VPN's Switching Routing**	**ROUTER$ Switches**
C $\#\lambda(rtt) \approx \frac{200 * e^{(t-200)^2}}{rtt}$	**dark fiber Optical switching**	**Lambda switching**	**Sub-lambdas, ethernet-sdh**

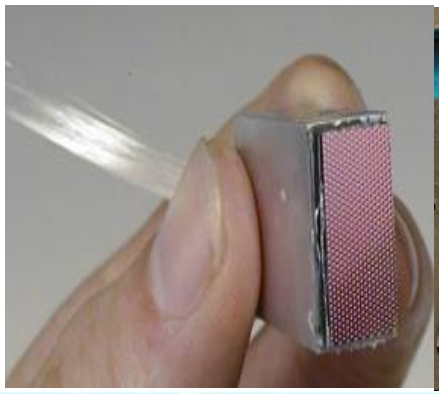
(Intermezzo)

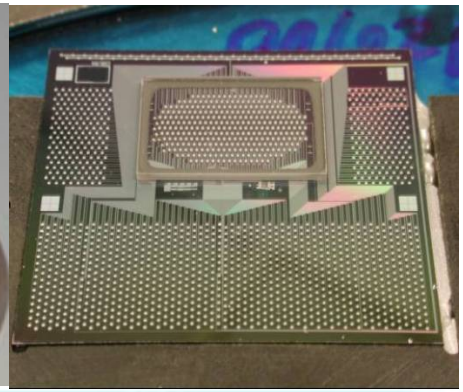
UVA/EVL's 64*64 Optical Switch @ NetherLight in SURFnet POP @ SARA

Costs 1/100th of a similar throughput router but with specific services!

Core Switch Technology







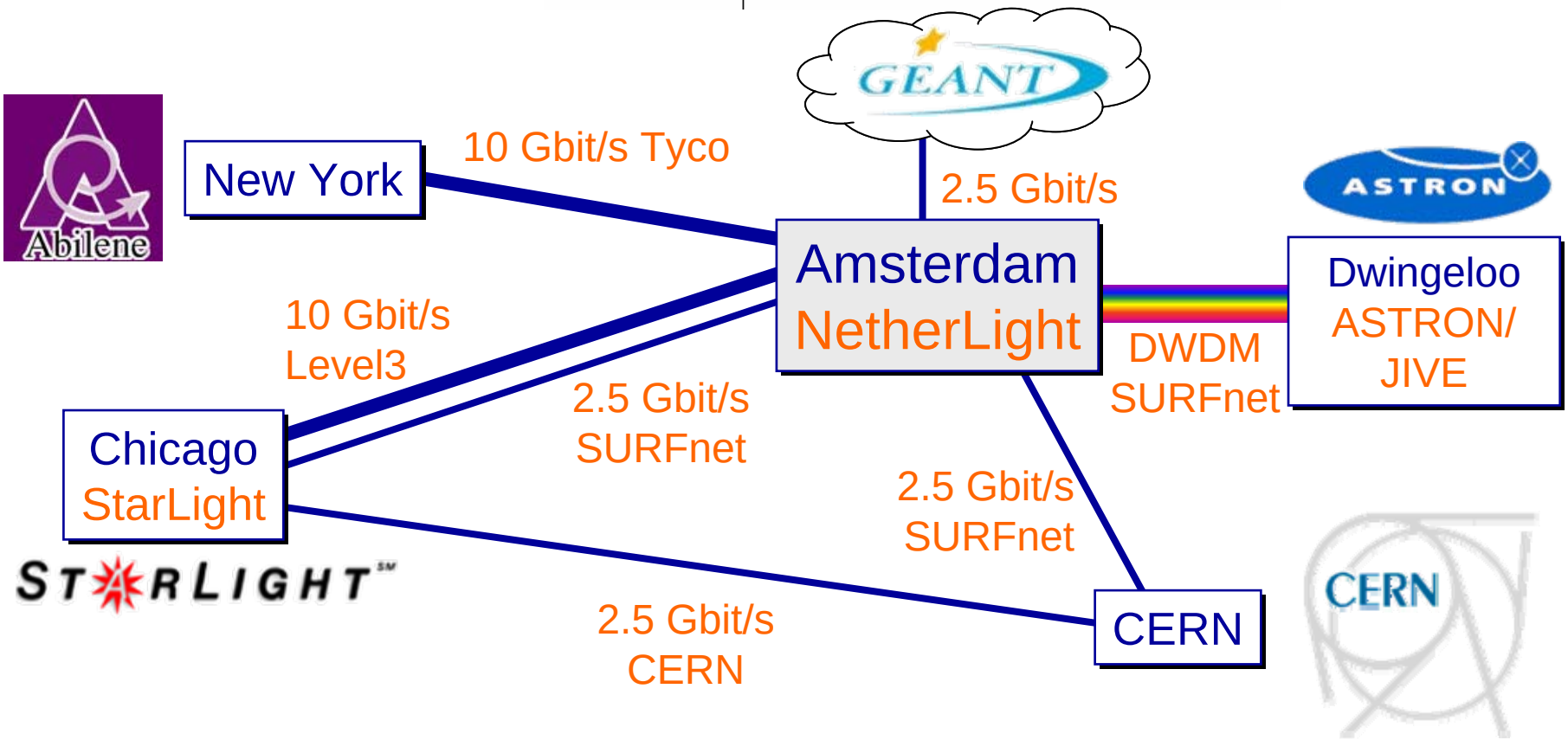
- **3D MEMS structure**
  - Bulk MEMS – High Density Chips
  - Electrostatic actuation
  - Short path length (~4cm)
  - <1.5 dB median loss
- **Completely Non-blocking**
  - Single-stage up to 1Kx1K
  - 10 ms switching time
- **Excellent Transparency**
  - Polarization
  - Bit rate
  - Wavelength

International networking in full operation

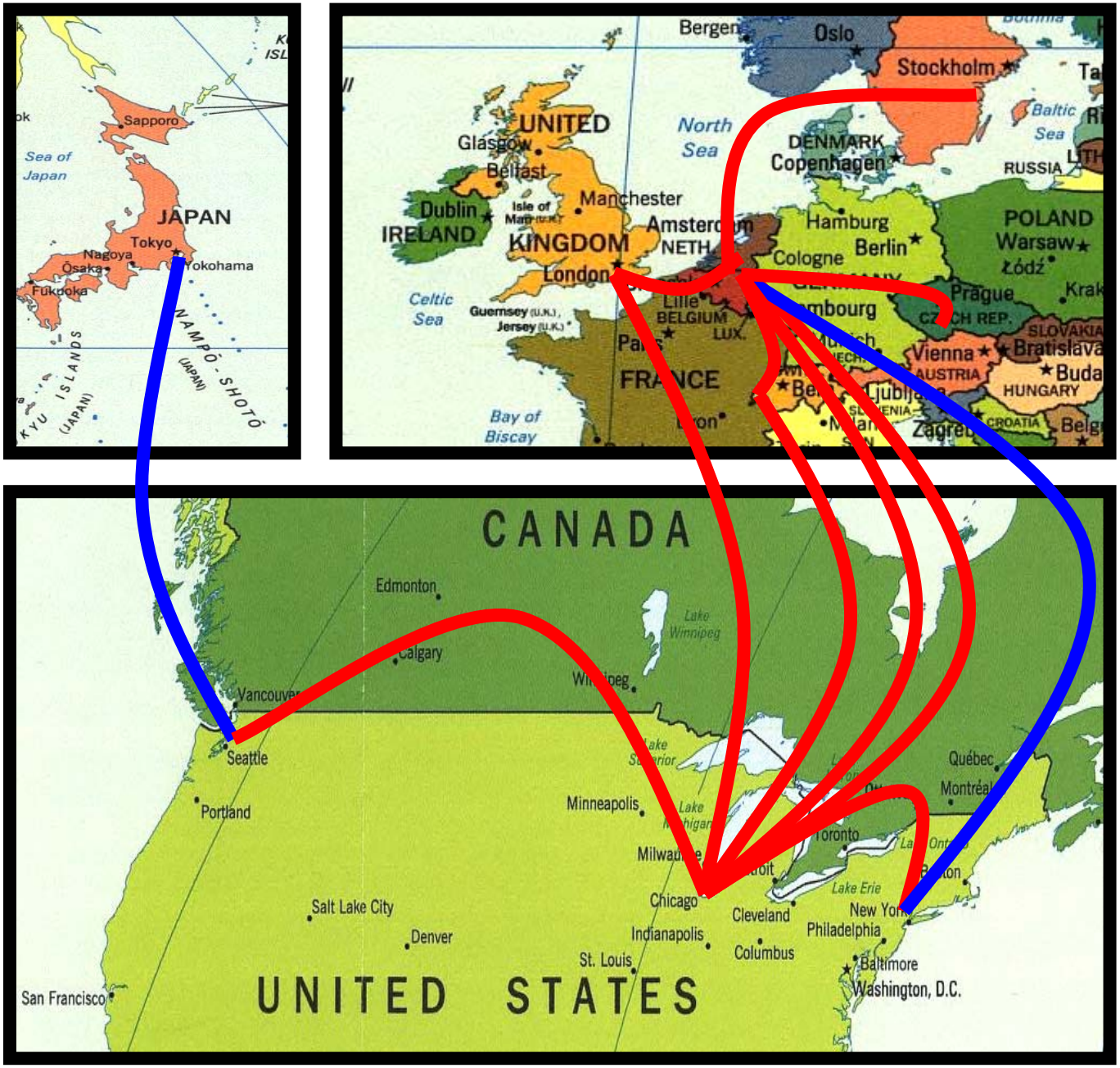
GigaPort

The network for

iGrid2002
The International Virtual Laboratory
www.igrid2002.org
www.startap.net/igrid2002



SURFnet



TransLight Lambdas

European lambdas to US
–6 GigEs Amsterdam—Chicago
–2 GigEs CERN—Chicago
–8 GigEs London—Chicago

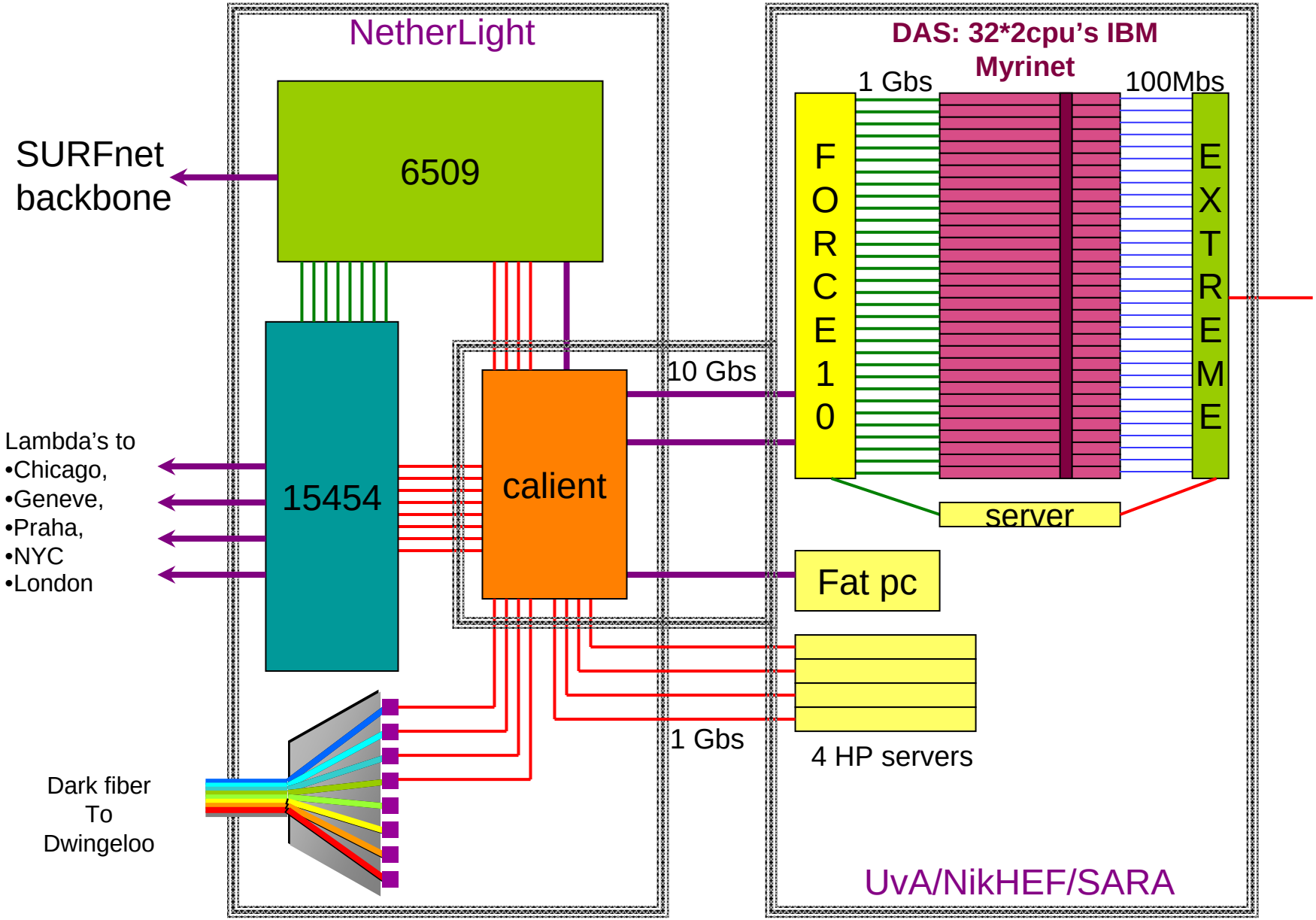
Canadian lambdas to US
–8 GigEs Chicago—Canada—NYC

–8 GigEs Chicago—Canada—Seattle

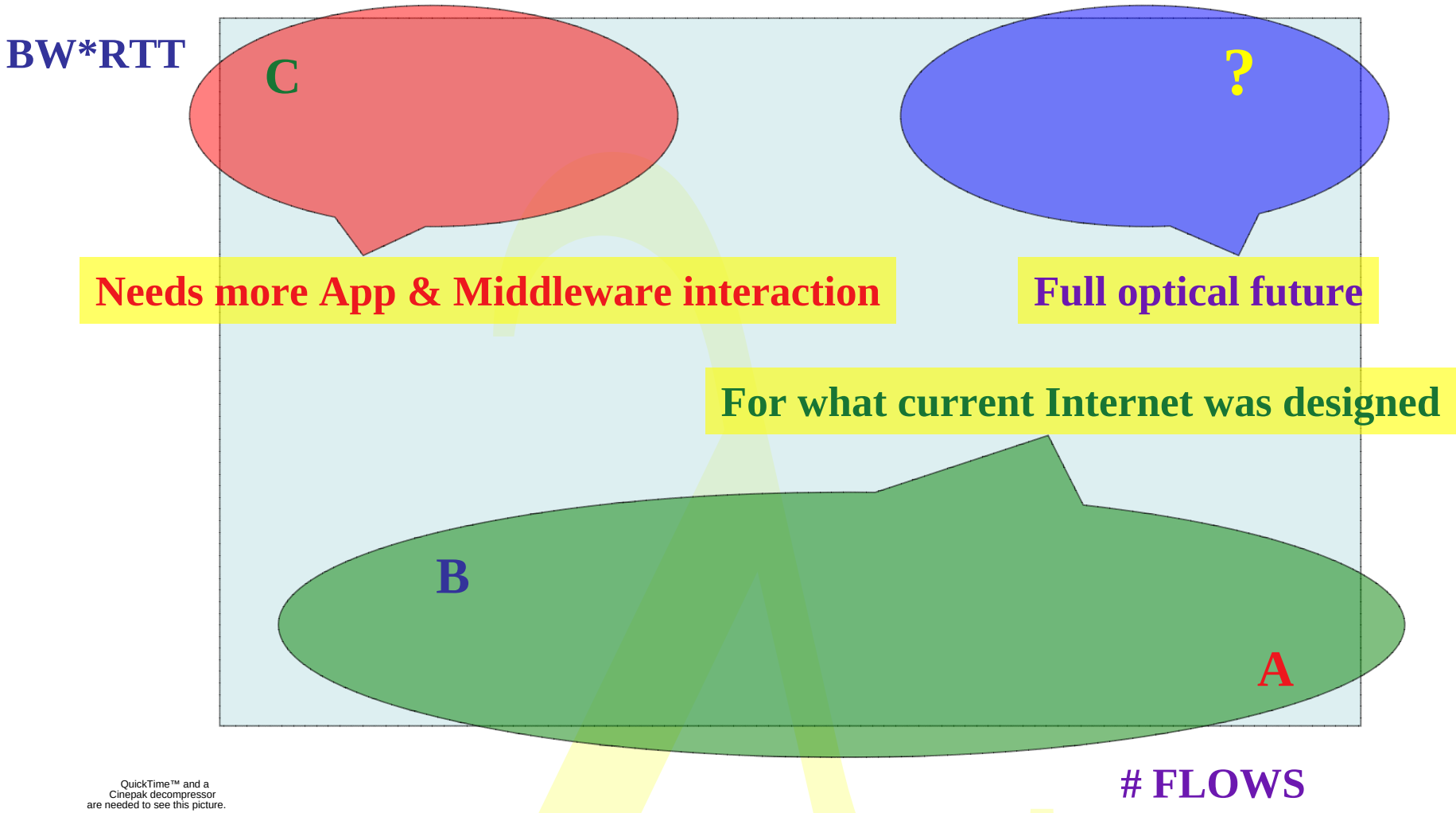
US lambdas to Europe
–4 GigEs Chicago—Amsterdam
–2 GigEs Chicago—CERN

European lambdas
–8 GigEs Amsterdam—CERN
–2 GigEs Prague—Amsterdam
–2 GigEs Stockholm—Amsterdam
–8 GigEs London—Amsterdam

IEEAF lambdas (blue)
–8 GigEs Seattle—Tokyo
–8 GigEs NYC—Amsterdam


NetherLight
DAS: 32*2cpu's IBM
Myrinet
1 Gbs
100Mbs
SURFnet
backbone
6509
F
O
R
C
E
1
0
E
X
T
R
E
M
E
10 Gbs
Lambda's to
•Chicago,
•Geneve,
•Praha,
•NYC
•London
15454
calient
server
Fat pc
1 Gbs
4 HP servers
Dark fiber
To
Dwingeloo
UvA/NikHEF/SARA

Transport in the corners



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Cinepak decompressor
are needed to see this picture.

Agenda

chair Kees Neggers

- 09h00 introduction by chair
- 09h15 agenda bashing
- 09h20 introduction of participants
- 10h00 format of subgroup discussions , three subgroups:
(RAP) research and applications, chaired by Cees de Laat
(TEC) technical issues, chaired by Erik-Jan Bos
(GOV) governance and growth issues, chaired by Kees Neggers
- 10h30 break
- 10h45 formation of subgroups, work on the problem statements (next slide)
- 12h30 break for lunch
- 13h30 reconvene, report from RAP, GOV and TEC
- 15h00 testbeds and deployments on 1, 2, 5 year scale
- 15h30 break
- 15h45 expected mid and long term developments, scaling up grid
- 16h30 identify technical work to be done and establish working groups for that
- 17h15 discussion about future of this kind of meeting
- 17h30 end

Problem statements & expectations

* overall goal: how to make next step towards an international Lambda Grid

* proposed problem statement for RAP subgroup:
  - Demonstrators for SC2003 and other conferences
  - layer 1 vs 2 model, services wanted by user community
* proposed problem statement for TEC subgroup:
  - connectivity requirements, equipment (wanphy, switches)
  - functionality, services
* proposed problem statements for GOV subgroup:
  - goals for next year in terms of Lambda's, connections, application support
  - governance: SLA's, SLS's, cross domain Lambda policies GOV